AIR CONDITIONING HEATING AND VENTILATING

For the Engineer
Engaged in DESIGN
APPLICATION
ESTIMATING
SPECIFICATION
and LAYOUT
for
AIR CONDITIONING
HEATING • VENTILATING
PIPING • PLUMBING

MAY 1961

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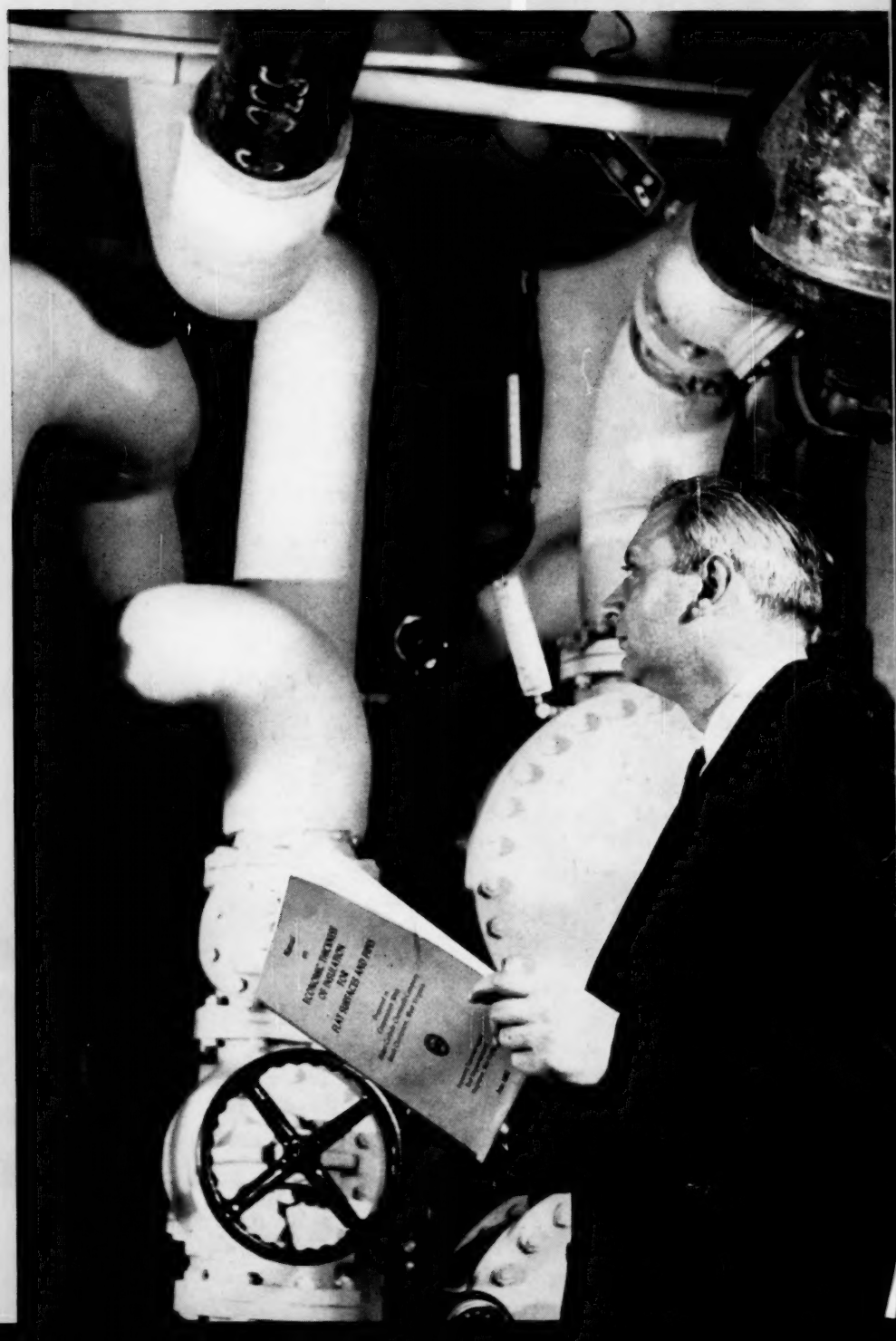
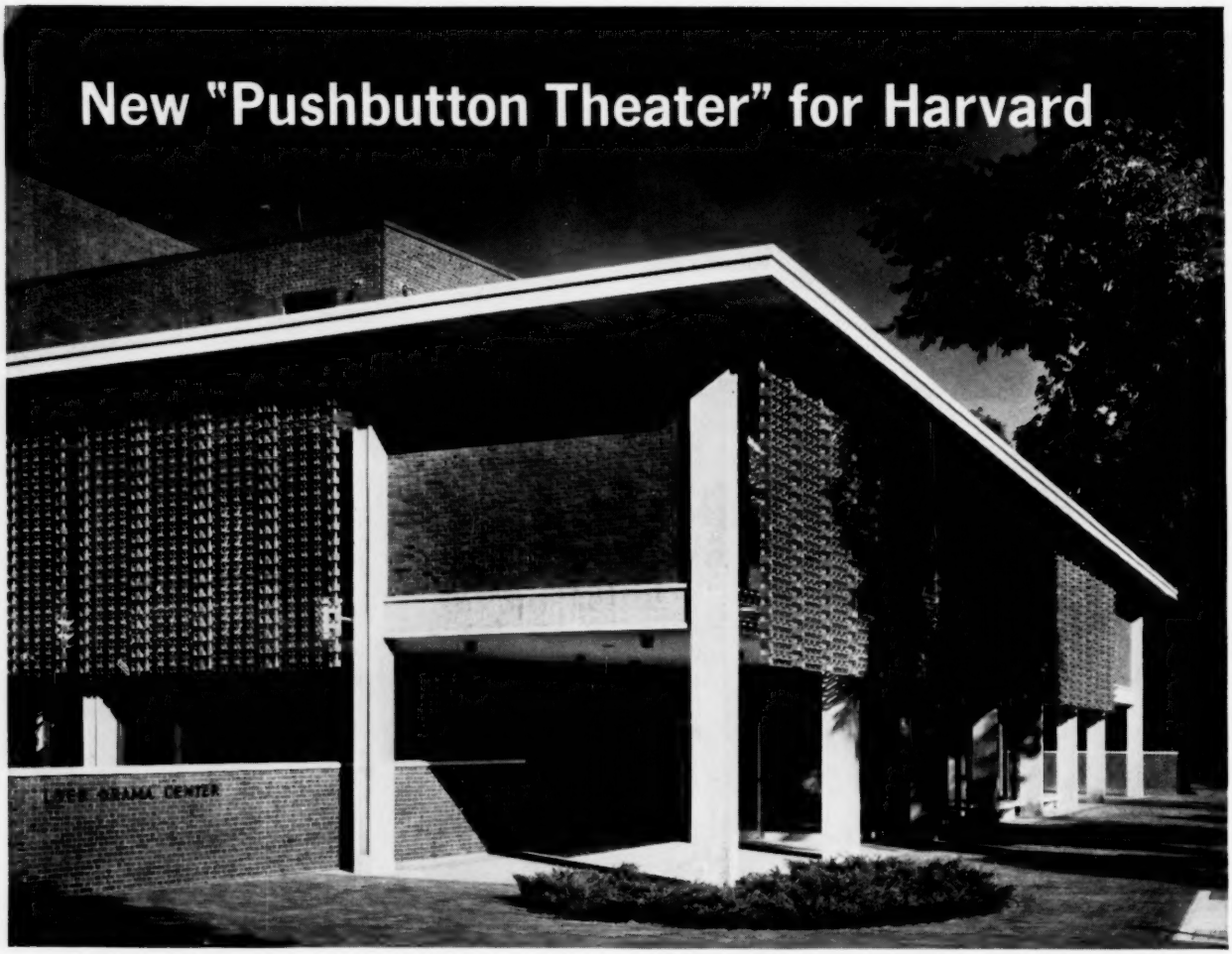
A Milestone in Insulation:

New manual enables engineers, for the first time, to select readily the most economical thickness of insulation for flat surfaces and pipe. Part of manual most useful to ACHV readers starts on page 65



New "Pushbutton Theater" for Harvard



LOEB DRAMA CENTER, Harvard University, Cambridge, Mass.

Architect: HUGH A. STUBBINS & ASSOCIATES, CAMBRIDGE, MASS. *Plumbing & Heating Engineer:* DELBROOK ENGINEERING, INC., CAMBRIDGE, MASS. *General Contractor:* GEORGE A. FULLER CO., NEW YORK, N. Y. *Plumbing & Sprinkler Contractor:* C. H. CRONIN, INC., BOSTON, MASS. *Heating, Ventilating & Air Conditioning Contractor:* THOMAS G. GALLAGHER, INC., SOMERVILLE, MASS.

JENKINS VALVES Specified for Trouble-free Control of All Service Lines

In the new Loeb Drama Center you push a button, get a conventional, Broadway-type stage. Push another, an "apron type" stage for Elizabethan drama. Push a third — and *voila* — you have modified "theater-in-the-round!"

This well may be the finest, the most versatile and responsive theater in history. One thing is sure: its builders, architects and engineers insisted on *practicality* along with the stuff of which theatrical dreams are made. They specified Jenkins Valves throughout the building for the entire complex of heating, piping and air conditioning lines.

To the men who design, build and operate America's distinguished buildings, the specification "JENKINS" is a trusted protection against costly valve maintenance and replacement. And they commonly provide this protection, knowing that Jenkins Valves *cost no more.* Jenkins Bros., 100 Park Avenue, New York 17.

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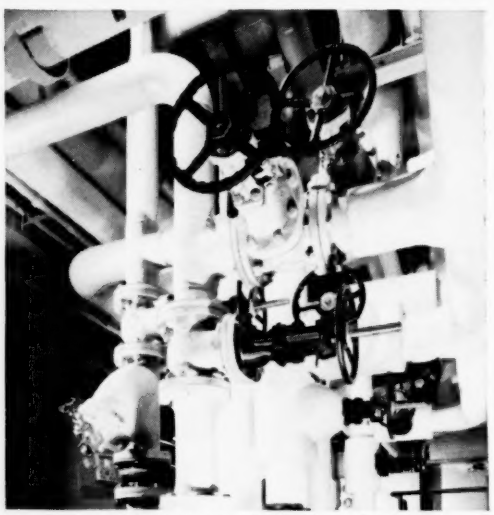

Jenkins Iron Body Gate Valves in the theater's piping system

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LOOK FOR THE JENKINS DIAMOND

VALVES

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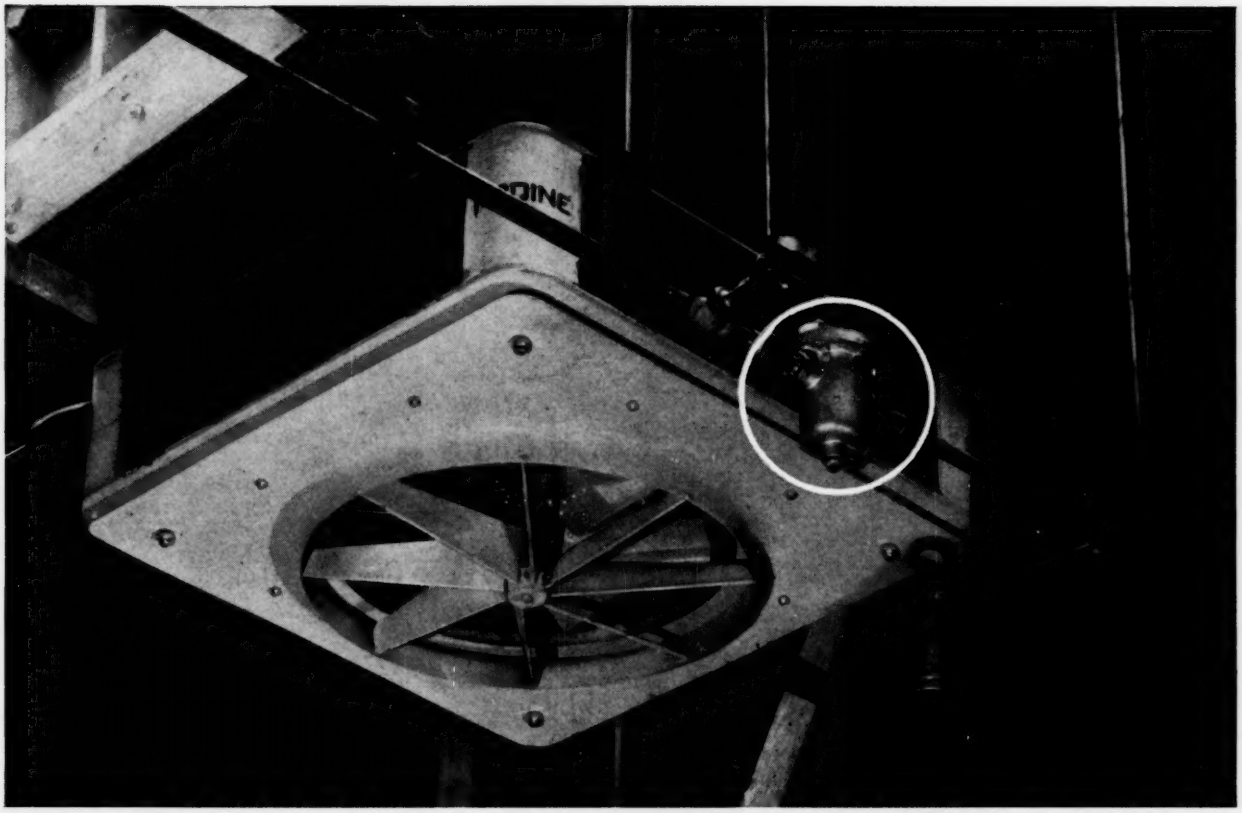
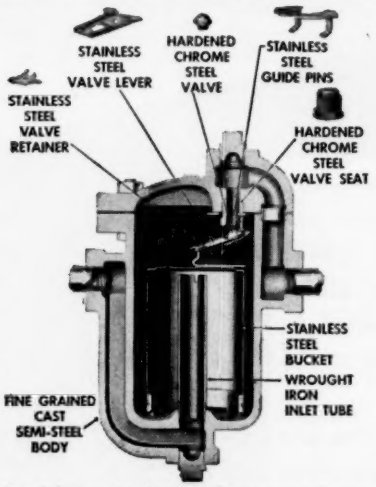


How Corrosion of Unit Heaters is Prevented by Good Trapping


STAINLESS STEEL VALVE LEVER
HARDENED CHROME STEEL VALVE
STAINLESS STEEL GUIDE PINS
STAINLESS STEEL VALVE RETAINER
HARDENED CHROME STEEL VALVE SEAT
STAINLESS STEEL BUCKET
WROUGHT IRON INLET TUBE
FINE GRAINED CAST SEMI-STEEL BODY

Good design, good materials mean good trapping with Armstrong Traps for unit heaters.

Cause. Costly corrosion of unit heaters is frequently the result of sluggish condensate drainage and inadequate venting. Any carbon dioxide gas present in the steam supply will go into solution if the condensate is below steam temperature, forming corrosive carbonic acid. Presence of oxygen aggravates the corrosion.

Remedy. Armstrong traps prevent carbonic acid formation because they discharge condensate *at steam temperature* and vent CO_2 and air at the same time. There is never any accumulation of condensate and incondensible gases to cause trouble as can occur with traps that must wait for condensate to cool before they will open.

Trap Selection. It is important that the traps be correctly sized, with a generous safety factor to provide adequate air handling capacity. Armstrong sizing recommedations are thoroughly reliable, being based on actual performance of the traps under operating conditions rather than on theoretical considerations.

Complete Details. Ask for Armstrong Bulletin No. 252 which tells how to select and install traps for any type of unit heater. For your free copy, call your local Armstrong Factory Representative, or write direct.

860 Series for low pressure heating service.

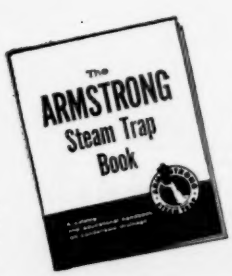
800 Series, side inlet, side outlet.

No. 801, side inlet, bottom outlet.

880 Series, integral strainer.

200 Series, bottom inlet, top outlet.

Forged Steel Series for high pressures, high temperatures.



The 48 page Armstrong Steam Trap Book tells how to correctly size, install and maintain steam traps for any pressure, any temperature, any load plus full catalog data on Armstrong Steam Traps. Ask for Catalog K.

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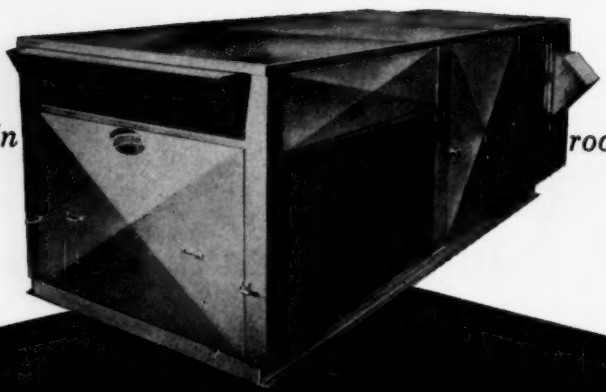

roof-mounted air conditioning

The 10 ton model pictured above is a fine example of our line of 32 models . . . ranging in size from 5 to 20 tons. No commercial air conditioning requirement is too large or too small for the Atmos-Pak. We now have over 1,000 installations throughout the United States ranging from small stores, where two smaller units were needed, to large manufacturing plants, where 60 or more units have solved the problem.

Just three simple connections result in complete installation. This is a truly pre-fabricated system that requires absolutely no field assembly.

The Atmos-Pak is the proven answer to any planned or existing one story building. Why not write for a bulletin describing our many features?

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AIR CONDITIONING HEATING AND VENTILATING

For the Engineer
Engaged in DESIGN
APPLICATION
ESTIMATING
SPECIFICATION
and LAYOUT
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AIR CONDITIONING
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COVER PHOTO: Jaros, Baum & Bolles engineer Joseph Seid is shown checking mechanical work at new Chase Manhattan Bank skyscraper in New York's financial district. He is holding the new Manual on **Economic Thickness of Insulation for Flat Surfaces and Pipes,** reproduced, in part, in this month's Reference Section, page 65.

HIGH SPOTS in this issue

GAS TURBINES: For the past decade, gas turbines have been serving industry well in a variety of applications, generally having been custom sold on a basis of reliable and economical performance. By utilizing for air conditioning the easily recoverable waste heat accompanying power generation with these units, gas engineers foresee a **bright future for gas turbines in commercial and institutional type buildings.** The possibilities are explored by I. E. Rowe in this month's lead-off article, starting on page 55.

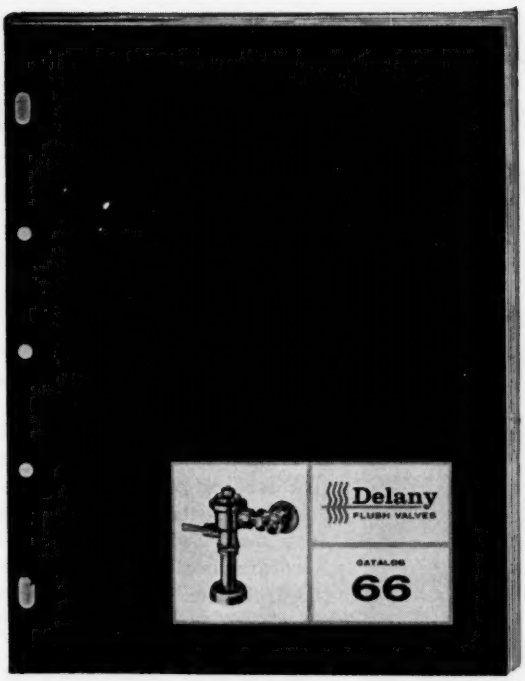
POOL VENTILATION DESIGN: Without adequate published data, the art of **swimming pool heating and ventilating design** had to be learned the hard way. Two engineers of Wohlpart Associates explain their design procedures developed after years of experience and the keeping of careful records of completed installations. Page 81.

A full-scale working reproduction of a time-saving chart for **sizing indoor pool ventilation** developed by the authors will be found on the Reference Data Sheet, page 85.

FURNISHED BY OTHERS: Misunderstandings, delays, and waste are often the consequence of specifications that include the familiar phrase, "furnished by others." A consultant in private practice suggests that the engineer ought to **explain the inadequacy of this provision** to the owner and what to do if the owner persists. Page 91.

WINTER COOLING: Flight simulators in a B.O.A.C. facility at London airport **create a winter cooling problem,** the solution of which is described by text and photograph in an article appearing on pages 60-61.

PLUMBING DESIGN: **Changes in plumbing design,** installation, materials and equipment over the past twenty years are reviewed and commented on this month by James Church. His article begins on page 89.



what's your flush valve I.Q.?

- ☐ *What makes a diaphragm operated flush valve superior to any other type of flush valve design?*
- ☐ *Where would you look for installation errors that cause flush valve mal-performance?*
- ☐ *How can you figure flush valve piping requirements easily and quickly?*
- ☐ *How wide a selection of flush valve models is available to meet the roughing requirements of almost any installation?*
- ☐ *How does the safest and surest flush valve vacuum breaker operate?*
- ☐ *How can annoying pipe line and valve closure noises be cut to a minimum?*
- ☐ *What are the possibilities of completely automatic flush valve operation by electric solenoid control?*
- ☐ *How can you regulate and time flush valves for peak performance with each individual fixture?*

Must reading for every plumbing man*. . . never before has any product been so thoroughly dissected and described as the Delany Flush Valve in the newly published Catalog 66. You'll find the answers to the questions above and many more in this 60 page handbook . . . the most complete information on flush valve selection, specification, and installation ever put into print. Get your free copy now. A request on your firm letterhead will put yours in the mail.

**Every day more and more engineers, contractors, and wholesalers are deciding on Delany.*

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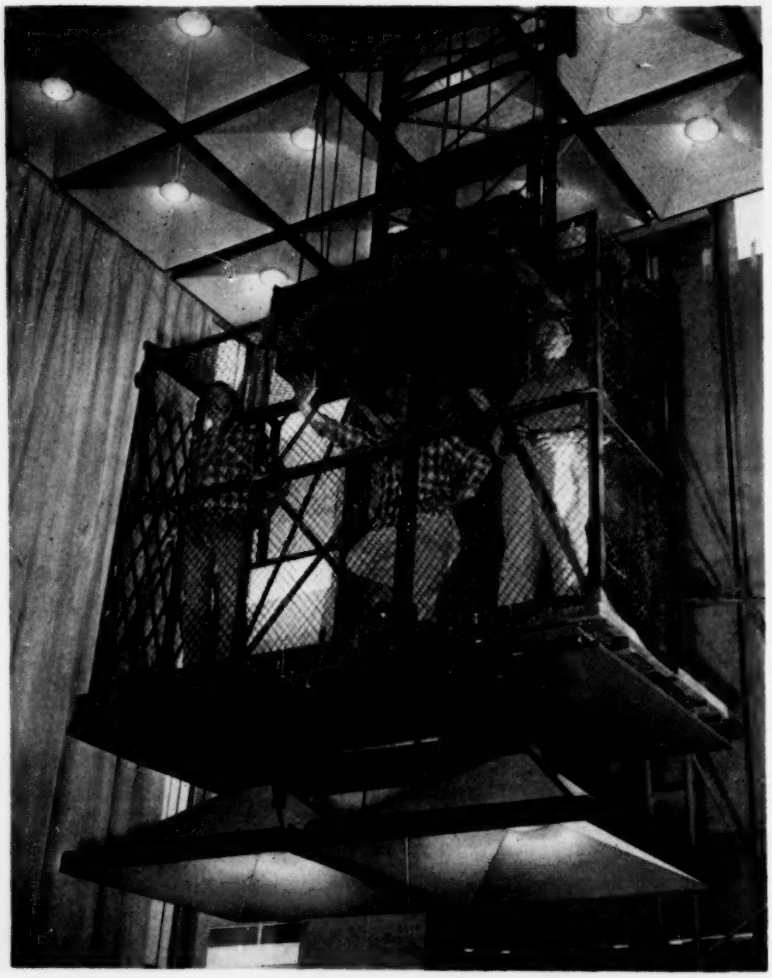
Delany FLUSH VALVES

NEWS OF THE MONTH



Custom-made, disappearing elevator, in ceiling of lobby of new First City National Bank building, Houston, Tex., decends from the ceiling at the touch of a button on a telescoping arm. Maintenance engineers ride up to ceiling where air-conditioning and other mechanical equipment is located. Bottom of elevator conforms to ceiling design. In 32-story marble and glass office tower attached to the bank is a 3600-ton air conditioning system, with gas-fired boilers, steam turbines, and centrifugal compressors at the top of the building. Jaros, Baum and Bolles were the consultants; Skidmore, Owings and Merrill, the architects.

BRI SPRING CONFERENCES IN WASHINGTON THIS MONTH

The 1961 Spring Conferences of Building Research Institute will take place May 16-18 at the Shoreham Hotel, Washington, D.C.

Program includes sessions on requirements for weatherproofing thin shell concrete roofs, activity reports on plastics in building, public entrance doors, pressure sensitive tapes for buildings, selection and field application of adhesives, and research reports.

Conferences are open to all interested persons. Non-member registration fee is fifty dollars. This year, advance registration is permissible. Further information may be had from BRI, National Academy of Sciences — National Research Council, 2101 Constitution Ave., Washington 25, D.C.

LOW-INCOME CO-OP APARTMENTS WILL BE CENTRALLY CONDITIONED

Worthington Corporation announced that it has received a contract from Afgo Engineering Company, Brooklyn, N.Y. to supply air conditioning units for mammoth Penn Station South, a $35 million low income cooperative housing project currently under construction in the Chelsea area near Pennsylvania Station. According to Worthington, this is the first time that a housing project of this type will be completely air conditioned.

Under joint sponsorship of the International Ladies Garment Workers Union and United Housing Foundation, the project being built by Mutual Redevelopment Houses, Inc., calls for the construction of ten 20-story apartment houses, serving 2,820 families. Worthington is providing 6700 fan-coil air conditioning units—the largest single order of its kind in the company's history.

The development will include a shopping center, playgrounds, parking facilities, gardens, as well as service and community rooms. Apartments will range from 2 rooms to 5½ rooms. Tenant owners will invest approximately $650 per room. Rentals are expected to average $22-23 per room per month.

Fan-Coil Units

The fan-coil units to be supplied consist of a basic water coil and air distribution fan with speed switch, control valve, motor and filter. Units allow comfort control on a person-by-person basis, with a minimum of complication in fitting the equipment to the structure. They can perform all the important functions of complete air conditioning; circulation, ventilation, filtering, heating, cooling, dehumidification.

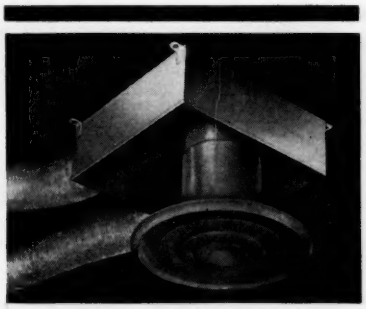
A Worthington unit will be installed in each living room and

(Continued on page 8)

Carnes is first to offer engineers and contractors a completely packaged low-velocity control unit specifically designed to meet the requirements of dual duct low-velocity systems. Carnes Low-Velocity ATC Units . . . where limited space does not demand the smaller duct size of high-velocity systems . . . offer all the advantages of individual room control inherent in dual duct air distribution systems. 2 ATC Ceiling Models — end discharge and bottom discharge in 5 sizes. 2 ATC Window/Perimeter Models — front and top discharge in 2 sizes.

LEADERS GO TO CARNES FOR THE NEWEST IN AIR DISTRIBUTION

Dual Duct Low-Velocity ATC Units



NOW DUAL DUCT COMFORT AT LOW-VELOCITY COST

Carnes Low-Velocity Acoustic Terminal Control Units — ATC — provide "pinpoint" temperature control for specific zones through the flexibility of dual duct air distribution without the need for sealed ducts, high pressure fans and high fan horsepower. Carnes Low-Velocity ATC Units proportion the hot and cold air in response to individual room thermostats . . . blend the hot and cold air for discharge to individual space areas . . . attenuate self-generated noise plus duct-carried noise . . . provide manual volume adjustment.

For complete information, write for Carnes Low-Velocity ATC Catalog 1361.

Carnes also manufactures: High-Velocity ATC Units • Modular, Round, Rectangular, Square, Convertible and Baseboard Diffusers • Registers • Grilles • Roof and Wall Ventilators.

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APARTMENTS CONDITIONED

(Continued from page 6)

bedroom in the new housing development. The units are connected to a supply and return water piping system emanating from a central heating and cooling system which delivers hot or chilled water. All the air handling takes place at each room conditioner location, and conventional ductwork to the units is not required. The water flow and air delivery may be individually regulated at each unit, thus providing the ultimate in a zone controlled system.

Assembled within an attractive, functionally-designed cabinet, these units will assure coolness in summer, warmth in winter and modulated climate between seasons. A manual control switch is furnished with all models, for individual regulation of air delivery.

Consulting engineer is William H. Dusenbury.

ENGINEERS GET CAPS—About 500 who attended ASHRAE'S Annual Meeting in Chicago took time out to don railroad engineer's caps and kerchiefs, board a special 12-car train for an old fashioned cow-scattering ride out to Morton Grove. At Bell and Gossett plant, marketing development manager Phil Kosch (in conductor's cap, above) explained some of the company's new air conditioning equipment to the visitors.

Model of Clinical Center and auxiliary buildings in wind tunnel. View looking downwind shows sampling probe held by traverse carriage and tunnel fan in background.

Low-Speed Wind Tunnel Study Finds Cure for Foul Air Recirculation

Often a nuisance—and sometimes a hazard—to persons who work in air-conditioned buildings is the recirculation of noxious air through ventilation systems. Research scientists at New York University, working with a low-speed wind tunnel in which meteorological conditions can be reproduced to scale, have developed ways to reduce this potential hazard.

An analysis of odor complaints at the research center building of the National Institutes of Health at Bethesda, Md., resulted in a field study that indicated the presence of some cross-circuiting of air, depending on wind direction. Fumes from several research laboratories are discharged through ducts to vent on the roof of the building.

At the conclusion of the field study, several structural modifications were suggested. These modifications were designed to eliminate odors and cross-circuiting under varied wind conditions.

To evaluate the proposed changes before investing in relatively expensive structural work, the Institutes' Division of Research Services entered into a $7,500 contract with the Research Division of NYU's College of Engineering, which performed wind tunnel tests on a model of the Bethesda Research Center.

Research scientist James Halitsky, who directed the work, established levels of concentration of tracer gas at the air intakes of the model under a variety of simulated wind conditions and determined the degree of relief offered by the recommendations.

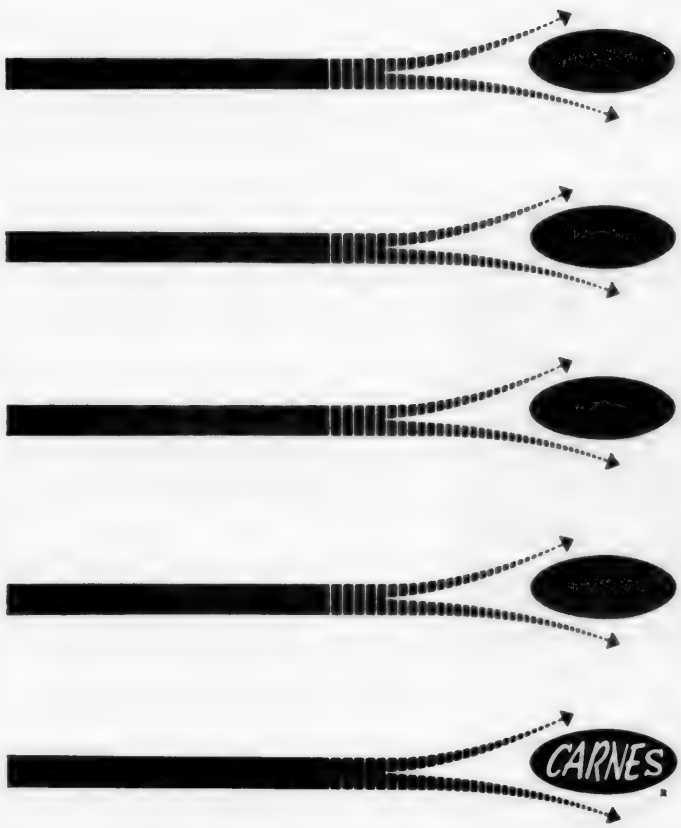
Mr. Halitsky, studying the general problem of air pollution around buildings for the last two years, has made quantitative studies of gas circulation near building walls and roofs for structures with a variety of simple geometric shapes. The principles developed were used in the recent tests.

Information provided by these studies is expected to influence the architectural design of ventilation systems in future government hospitals. Model testing should prove effective also in preventing the return of incinerator and furnace effluents to factories, office and apartment buildings.

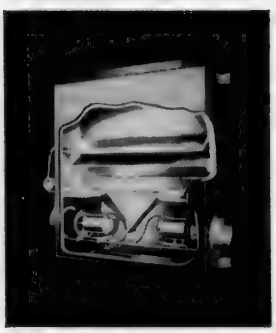
The wind tunnel is used for theoretical studies of gas diffusion and for case studies of air pollution by industrial plants. The tunnel's wind speed can be controlled as low as 0.75 fps, and temperature and speed variations with height can be reproduced to simulate the actual atmosphere.

Carnes engineers lick high-velocity split service problems with new simplified all-pneumatic constant volume control. Only Carnes new Acoustic Terminal Control Units offer all these features: positive temperature mixing with integral blender; full acoustic baffling; inch-thick acoustic lining; metal protection on leading edges of lining; flow path not obstructed by perforated material; accurate pressure-drop sensing tips; non-stick, leak-free resilient valve seats. 3 ATC ceiling models — end discharge . . . bottom discharge . . . multi discharge. 2 ATC window/perimeter models — front discharge . . . top discharge. All models are available in single or dual duct with full control selection.

LEADERS GO TO CARNES FOR THE NEWEST IN AIR DISTRIBUTION



High-Velocity All-Air ATC Units



Carnes Acoustic Terminal Control Units feature new simplified all-pneumatic constant volume control with direct valve to motor connections, eliminating troublesome mechanical devices such as curtains, flappers, bladders, linkages. Carnes new ATC Units assure trouble-free lifetime operation. Investigate now. Write for ATC Catalog No. 1160.

Carnes also manufactures: Low-Velocity ATC Units • Modular, Round, Rectangular, Square, Convertible and Baseboard Diffusers • Registers • Grilles • Roof and Wall Ventilators.

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Industrial Hygienists Told: Base Underground Garage Ventilation on Cars, Not Area or Volume

Ventilation rates for existing underground garages throughout the country vary by as much as 200%, those attending the American Industrial Hygiene Conference (Detroit, Mich., April 9-13) were told by George M. Hama, Bureau of Industrial Hygiene, Detroit Department of Health.

Finding this situation highly unsatisfactory, as far as design data for this increasingly popular type of structure are concerned, Mr. Hama and other members of Detroit's energetic Industrial Hygiene Bureau made an exhaustive study of the city's Grand Circus Park underground garage. Utilizing carbon monoxide recorders, walkie-talkies and stop watches, they attempted to correlate carbon monoxide concentration, traffic density, design capacity and required ventilation, in order to establish minimum ventilation requirements for maintaining safe carbon monoxide levels in underground garages.

For the general service type of underground garage, the suggested permissible levels of CO concentration should be as follows:

Average concentration CO, over any 15-hr period—50 ppm

Peak concentration CO, for 1 hour or less—100 ppm

In order to maintain these concentrations, ventilation rates should be based on total car capacity of these garages, not on the older "air changes per hour" or "cfm per sq ft" methods. Final ventilation design data, for general service type garages, to control average CO concentrations to 50 ppm and short peak load CO concentrations to 100 ppm, were summarized by Mr. Hama as:

CFM required = 483 × capacity number of cars

The constant 483 is based on peak conditions and is a product of these observed values: 3.5% of total car capacity was found to be the maximum number of cars running at one time during short peak operations; and 13,800 cfm was the amount determined necessary to dilute CO from one car in garage to 100 ppm.

OPENS AUSTRALIAN BRANCH — Slocum & Fuller, New York City mechanical and electrical consulting engineering firm, has opened a branch office in Sydney, New South Wales, Australia, in association with Rankine and Hill, Australian civil and structural engineering firm. Shown above studying blueprints in the Australian office are (left to right) John Rankine, partner, Rankine and Hill, Daniel Barton, senior associate member of Slocum and Fuller, and John K. M. Pryke, senior partner, Slocum & Fuller.

PRE-ASSEMBLED WALL PANELS AIMED AT LOW-COST HOUSING

A newly developed system that permits simultaneous erection of exterior and interior wall surfaces, ready for final finishing, has been developed by Johns-Manville Corporation after several years of research at the company's Research and Engineering Center, Manville, N.J.

The system, aimed at producing lower cost, quality housing, uses both a prefabricated, modular panel complete with vapor barrier and insulation (a new board product developed especially for this application) and a new adhesive joint compound. The products and method for residential construction is named the Flex-ponent system. Panels can be used to construct houses of almost any architectural design. Standard size is 4 x 8 ft, but other sizes will be available.

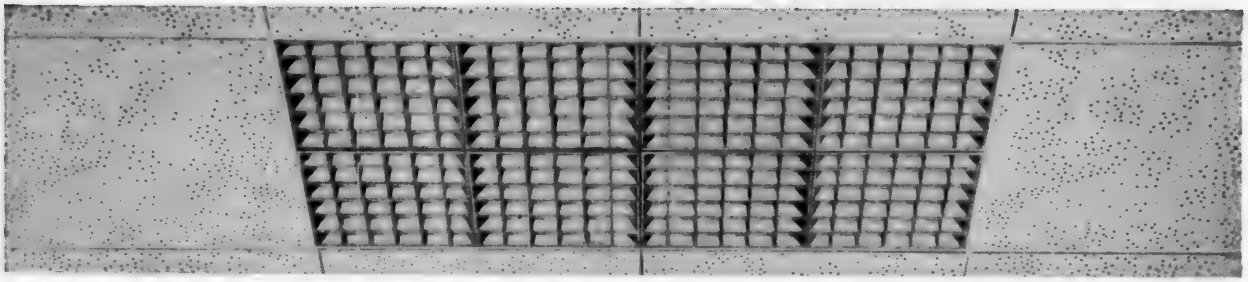
Initial distribution will be limited to an area around St. Louis, Mo., via the company's regular distribution channels. The area will be expanded as rapidly as public acceptance dictates, the company said. Home building methods have changed very little since colonial days. J-M officials believe that the Flex-ponent system represents a major technological breakthrough and could have far-reaching effects in lowering costs for quality homes.

HEATING, COOLING COSTS CUT WITH INSULATING GLASS

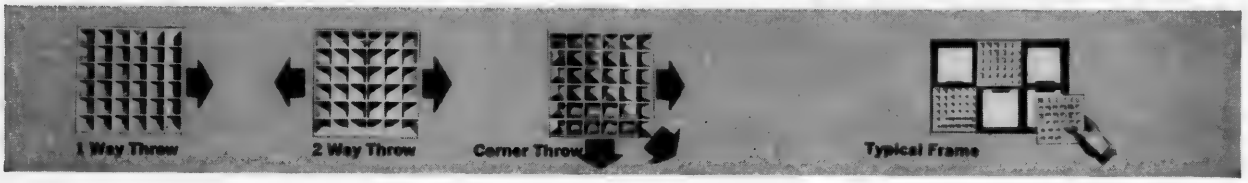
Savings on air conditioning and heating that accrue from lower tonnage requirements and lower operating costs are substantiated for double-paned insulating glass in a comprehensive engineering study conducted by Guy B. Panero Engineers, New York, N.Y.

Subject of the study was the Libbey-Owens-Ford building in Toledo, Ohio; the glass was LOF's Thermopane insulating glass.

(Continued on page 12)



LEADERS GO TO CARNES FOR THE NEWEST IN AIR DISTRIBUTION



NEW

Modular Diffuser patent applied for

FUNCTIONAL! VERSATILE! UNOBTRUSIVE!

Carnes attractive white Model "M" Modular Diffuser enhances the aesthetic quality of any ceiling. The 6-inch square modules fit virtually flush with ceiling . . . have a minimum of see-through . . . inhibit smudging . . . easily slip in or out for changing air direction or cleaning. An infinite number of patterns and sizes are yours by combining multiples of three modules: 1 way throw, 2 way throw, corner throw. Continuous strip patterns . . . cross patterns . . . alternating patterns may be developed to solve any design or air distribution problem. Module units . . . above windows . . . between fluorescent fixtures . . . around columns or walls . . . butted to light fixtures . . . carry out architectural lines and blend with all ceiling materials. They are equally effective when used as an air return. Modules are made from General Electric's revolutionary new LEXAN, a self-extinguishing, high-impact material that withstands temperatures to 225° without distortion. Frames are available in a wide variety of sizes and types . . . easily joined to make any continuous length or width desired. For complete details, write for Modular Diffuser Catalog No. 480.

NEW

NEW

NEW

NEW

Carnes also manufactures Round, Rectangular, Square, Convertible and Baseboard Diffusers • Registers • Grilles • High- and Low-Velocity ATC Units • Roof and Wall Ventilators

CARNES CORPORATION, VERONA, WISCONSIN, / CANADIAN SUBSIDIARY: WEHR AIR EQUIPMENT COMPANY, LTD., 86 GERTIE STREET, WINNIPEG 2, CANADA

INSULATING GLASS

(Continued from page 10)

The detailed study was focused on the building because it is a very new and outstanding example of commercial architecture, because its designers were given a broad directive in its creation, and because its owners wanted it to create beauty and to reflect the long-time good neighbor policy for its plants and properties as well as exhibit its glass products.

Occupied little more than a year by executive offices of LOF, the 15-story office building is pure curtain wall construction, the outer walls being approximately 90% glass. Fixed windows, 1120 in all, are of Thermopane insulating glass, grey plate on the outside and clear inside. They are 10 ft high and 5½ ft wide. Connecting spandrels (the company's heat tempered Vitrolux) are 3 ft high and 5½ ft wide.

Other than the glass walls of the building, the orientation of the building and the geographic location of Toledo were taken into consideration in arriving at the conclusions of the study.

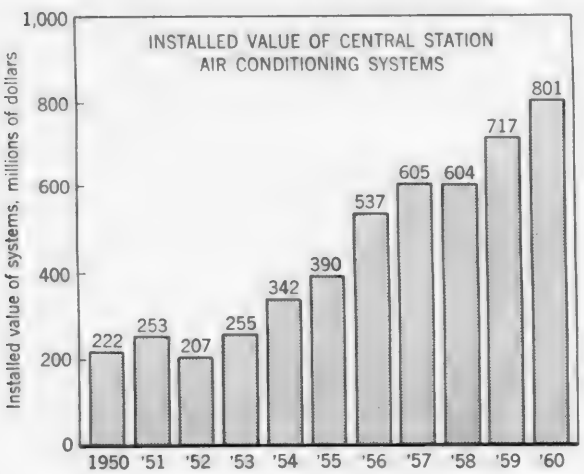
Pertinent findings of the Panero study show that:

(1) The use of double insulating Thermopane glass as compared with a single pane of the company's Parallel-O-Grey plate, which also has heat reducing values, reduced air conditioning requirements by 92 tons thus reducing the initial cost of air conditioning equipment by $55,200;

(2) Operating costs on the same comparison would bring an annual reduction of $2,190 for air conditioning and $5,030 in heating costs, so that the combined savings of $7,220 would pay for the premium cost of Thermopane in 3½ years.

The Panero report points out further that if the additional cost of the double insulating glass used as compared with single glazing of Parallel-O-Grey and the extra cost for the air conditioning equipment required if single glazing had been used, were both considered as investments at 3%, then a cost comparison for this portion of the building shows that it would be more economical to use Parallel-O-Grey Thermopane than to use single glazing of Parallel-O-Grey plate.

The same savings would have applied had LOF's green-tinted heat absorbing plate glass been used instead of grey Thermopane, the report says. Heat absorbing plate and Parallel-O-Grey exclude approximately the same amount of the sun's heat.



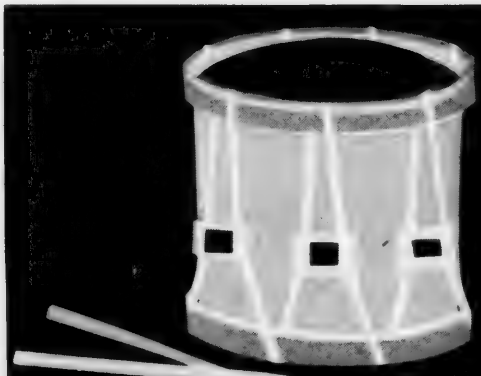
Installed value of central station air-conditioning systems which went into operation in large multi-room buildings and commercial and industrial applications in the U. S. during 1960 is estimated at $800,810,000 compared with $716,570,000 in 1959, Air-Conditioning and Refrigeration Institute, Washington, D. C., reported. Estimated value of systems for each year since 1950 is shown above. Figures are based on shipments of compressors, condensing units, absorption systems, and centrifugal and reciprocating liquid-chilling packages of 25 hp and over. They do not include any figures for brine chillers or equipment utilizing ammonia as refrigerant. Actual cost of the equipment included in the base is estimated at about 10% of the installed value of central station systems. The remainder includes air-handlers, labor, ducts, controls, insulation, plumbing, and all other installation costs.

IONS AFFECT BEHAVIOR; BUT WHY AND HOW?

Atmospheric ions — tiny particles and gas molecules with positive or negative electrical charges —may significantly affect human behavior in space vehicles, nuclear submarines, and in everyday situations, according to Battelle Memorial Institute scientists attending the annual meeting of the Institute of Environmental Sciences, Washington, D.C.

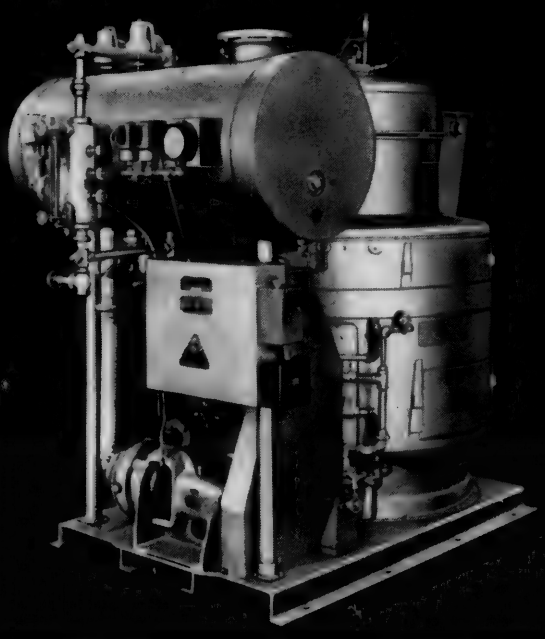
There is no question that atmospheric ions can have an effect on human behavior, but the amount of this effect and the ion polarity responsible for the change is not presently predictable, reported Dr. Howard G. Schutz and Richard A. Duffee of the Columbus, Ohio research center. They said that further research is needed to investigate: (1) the process by which ions affect the human body, (2) conditions under which effects occur, and (3) means by which ions may be used advantageously.

(Continued on page 118)



THIS DRUM IS FOR MUSIC...

THIS DRUM IS FOR POWER!



Vapor DRUM MODULĀTIC water tube boiler

World's Most Compact Heat and Power Package

200 BHP in only 40 sq. ft.

This pocket-sized power package hits the right note with engineers everywhere. It's compact, efficient...takes only 5' x 8' of floor space. Costs less to install...delivered completely assembled, wired, pre-tested; needs no special foundation, fits through plant doors, can be installed in any unused corner or aisle. Costs less to operate...modulating controls produce steam only "on demand," save fuel. Full steam pressure in 5 minutes from cold start. Ends early-morning shift to fire-up. Fully automatic, push-button operation. Most flexible...multiple-unit installations meet widely-varying, or peak-load steam requirements. Single, coordinating control cuts individual units on or off as steam demand varies. Easiest to maintain...all parts are readily accessible. Sizes: 20 to 200 hp; 0-15, 5-150 psi steam pressure; 670,000 6,690,000 btu/hr. Burns oil, gas, or both fuels. Meets all codes.

Send for free literature:

VAPOR

Our requirements are:

BHP REQUIRED_____

SAFETY VALVE SETTING_____

MINIMUM STEAM LOAD_____

MAX. STEAM LOAD_____

STEAM PRESSURE_____

TYPE OF FUEL_____

VAPOR HEATING CORPORATION, Dept. 27-E
80 E. Jackson Blvd., Chicago 4, Illinois

Please rush me your free bulletins on Modulātic Water Tube Boilers.

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TITLE_____

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CITY, ZONE, STATE_____

52 FLOORS OF PERSONALIZED COMFORT

Johnson Control a Highlight in New Union Carbide Building

One of the nation's most exciting and modern structures, the Union Carbide Building contains over 1.1 million square feet of rentable floor space. Its air conditioning equipment includes a high-velocity conduit system with 6,000 perimeter induction units and, for the interior, a high-pressure dual-duct system with 54 central fan systems.

Throughout this pace-setting skyscraper, a specially planned Johnson Pneumatic Control System maintains an ideal climate for business efficiency. Some 4,000 thermostats, 4,000 control valves, and related controls were installed to assure personalized, air conditioned comfort at all times!

Shown above is one of two Johnson Pneumatic Control Centers located in the basement and one of the top floor offices. Their features include: continuous indication of room temperatures, air and water temperatures, and pressures at over 450 control points; remote adjustment of all systems; optional recording of any point shown; and schematic diagrams of all systems and their controls, plus a push-button viewer with zoned floor plans of each floor in the building.

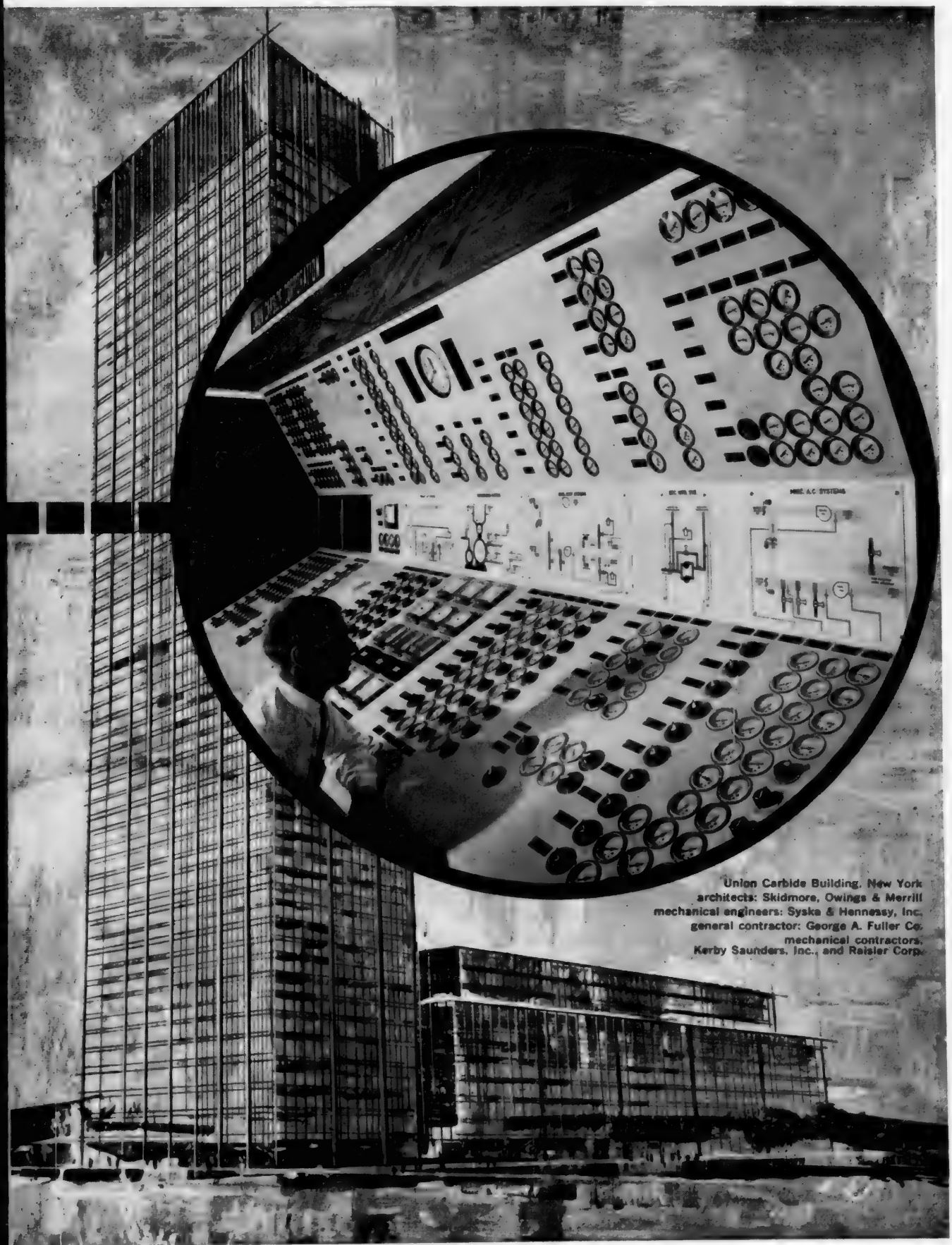
Engineered for economy as well as for comfort, the Johnson System makes possible major time and operational savings. With the aid of the control centers, for example, the number of man-hours required to supervise and control the vast network of primary air conditioning equipment is reduced to a minimum.

The specialized Johnson organization can help provide any building, small or large, with comparable efficiency and savings. Ask your Johnson representative to explain how the unmatched performance and lifetime economy features of Johnson Pneumatic Control can be applied to your clients' buildings. Johnson Service Company, Milwaukee 1, Wisconsin. 105 Direct Branch Offices.

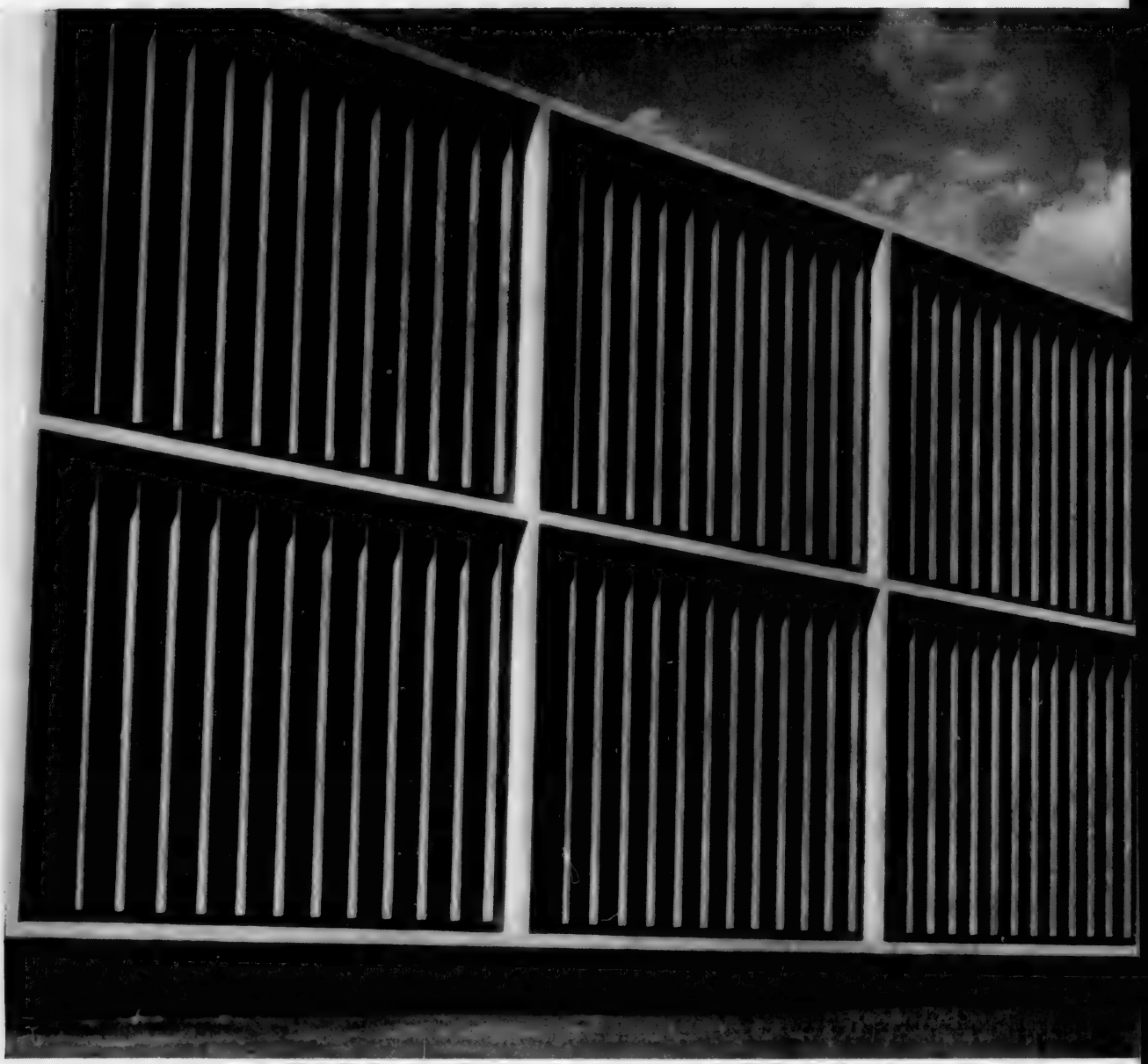
JOHNSON CONTROL

PNEUMATIC SYSTEMS

DESIGN • MANUFACTURE • INSTALLATION • SINCE 1885



Union Carbide Building, New York
architects: Skidmore, Owings & Merrill
mechanical engineers: Syska & Hennessy, Inc.
general contractor: George A. Fuller Co.
mechanical contractors,
Kerby Saunders, Inc., and Raisler Corp.



The Arkla Gas air conditioning unit uses the same gas-fired boiler that heats in winter to cool in summer.

As the Building grows, the ARKLA

The headquarters building of Yellow Transit Freight Lines, Kansas City, Missouri, was designed to take a third story without major alterations. That's why they chose Arkla gas cooling units . . . a system that can "grow" quickly and at low cost.

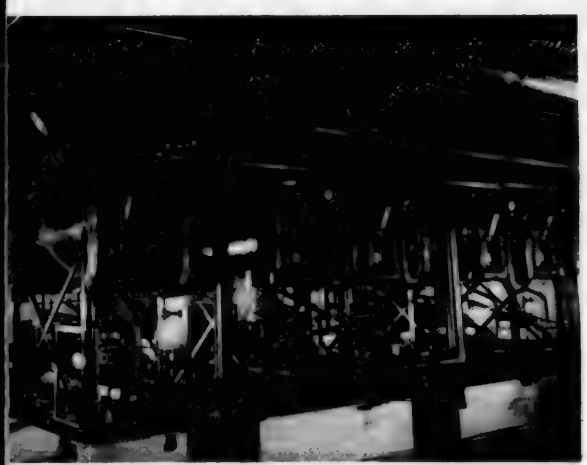
When the building expands, they'll just add an Arkla unit. They go on the line right next to the rest, using the same basic piping – and steam from the same gas-fired boiler that energizes all the Arkla units.

The present cooling system includes five 25-ton Arkla Gas

Architect: Folger & Pearson;
Mechanical Contractors: Troug & Nichols.

Modern gas cools and heats this headquarters building of Yellow Transit Freight Lines in Kansas City, Missouri.

GAS COOLING system grows with it



Absorption Water Chillers. These versatile units use steam from the gas-fired boiler to provide chilled water for comfort cooling. The same boiler heats in winter. And thrifty gas keeps fuel costs low.

For specific information on Arkla gas air conditioning, call your local Gas Company. Or write Arkla Air Conditioning Corporation, General Sales Office, 812 Main Street, Little Rock, Arkansas. *American Gas Association.*

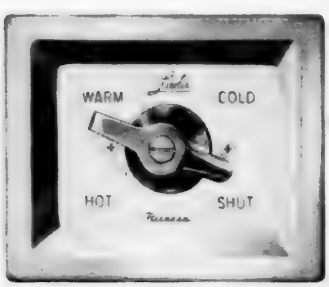
FOR HEATING & COOLING...GAS IS GOOD BUSINESS!

For increased cooling capacity, at low cost, additional Arkla units can be installed.

UARY–1990

	TUESDAY	EVERYDAY	THURSDAY	
			1	
	6		8	
	13		15	
	20		22	
	27		29	

SHOWERING COMFORT AND SAFETY FROM LAWLER SO FAR ADVANCED IT WILL NEVER GO OUT OF STYLE!



Recesso

The **Recesso's** "years ahead" styling leads the industry in thermostatic shower mixers. The **Recesso** is entirely recessed into the wall . . . eliminates dangerous protruding edges which might cause bodily injury or collect unsanitary dirt, grime and soap scum.

Lawler's advanced thermostatic element gives the **Recesso** new sensitivity and instant action for truly safe, comfortable showering. Your customers will enjoy the beauty and safety features of the **Recesso** years from now!

FOR TIMELESS PERFORMANCE STANDARDS LOOK TO LAWLER . . . FIRST!

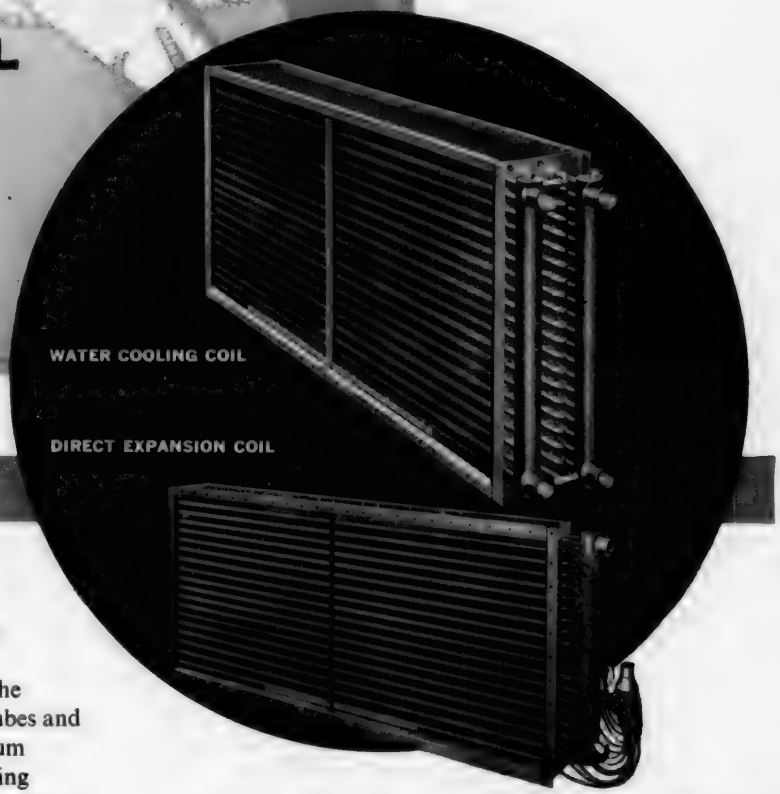
LAWLER AUTOMATIC CONTROLS INC., MT. VERNON, N.Y.

HI PERFORMANCE EFFICIENCY

with the new
TYPE "5" COIL

any size
any style
any material

for water, steam, direct expansion or special fluids



McQuay Means Quality

The new McQuay Type "5" coil design offers you a new high in fin efficiency by attaining the highest heat transfer rate possible without excessive air friction. The combination of equilaterally staggered tubes and modified rippled fins produces a maximum of air turbulence to interrupt the insulating boundary layer film and still retain the intimate and prolonged contact between air and the heat exchanger surface.

Each Type "5" coil features practically an unlimited flexibility in selection of coils to more accurately meet load requirements. Standard coils are furnished with copper headers and flow-controlled circuiting to assure the turbulent fluid flow necessary without using restrictive internal devices.

For any coil requirement, look to McQuay. Call your local McQuay representative or write to McQuay Inc., 1619 Broadway N. E., Minneapolis 13, Minnesota.

THE NATION'S LARGEST COIL MANUFACTURER

SELECT McQUAY STANDARD COILS FROM ANY COMBINATION OF THE FOLLOWING:

Single Serpentine . . . . . One to 14 fins per inch
Half Serpentine . . . . . From 6" through 36" high face
Double Serpentine. . . From 6" through 144" nominal tube length

ALSO AVAILABLE IN SPECIAL CIRCUITS, FIN SPACINGS, SIZES AND MATERIALS

McQuay INC.

AIR CONDITIONING • HEATING • REFRIGERATION

SOFTITE BY WHEELING
COP-R-LOY

"First choice by far!"

—That's what they're saying all over America about Wheeling SOFTITE Galvanized Sheets! For SOFTITE has everything sheet metal men want in a galvanized sheet. Here's why:

1. SOFTITE sheets work easier because they are soft and ductile.
2. SOFTITE's galvanized coating is applied so tightly that it actually becomes a part of the steel base . . . can't flake or peel no matter how you twist or torture it.
3. SOFTITE, made of famed Cop-R-Loy, lasts longer . . . will give more years of extra service for your customer's dollar.

Get the full facts on dependable, easy-to-work SOFTITE Galvanized Cop-R-Loy Steel Sheets from your Wheeling man this week. Or write directly to our nearest sales office.

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IT'S WHEELING STEEL!

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WHEELING STEEL CORPORATION

DISTRICT OFFICES:				
Atlanta	Buffalo	Cincinnati	Houston	St. Louis
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WHEELING CORRUGATING COMPANY *Subsidiary*

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Buffalo	Houston	Minneapolis	Richmond
Chicago	Kansas City	New Orleans	St. Louis

PPG Fiber Glass Pipe Insulation is quickly installed, provides top thermal insulation at Fontainbleau Towers addition in Miami Beach. 100,000 ft of this insulation was used, as well as PPG Duct Liner and Duct Insulation.

"We chose PPG Fiber Glass Insulation Materials because they are easier to handle than any other insulation products"

. . . says Mr. Joseph Crabtree, President, Crabtree Insulation Company, Miami, Florida

Crabtree Insulation Company had the contract to install all pipe and ductwork insulation in the new 405-room addition to Fontainbleau Towers, Miami Beach. Choice of materials was given to the company.

Mr. Crabtree asked his superintendent what materials he felt should be used, and was advised that the men preferred PPG Fiber Glass Insulation Products because they were easier to handle.

As a result, Crabtree Insulation Company used 100,000 ft of PPG Pipe Insulation, 25,000 ft of PPG Neoprene-coated Duct Liner, and 25,000 ft of PPG Duct Insulation in the new Fontainbleau Towers addition.

Mr. Crabtree reports the insulation job went faster and with fewer problems than if other materials had been used. On the basis of this job and other jobs where he had used PPG materials, he would recommend PPG with no hesitation to other contractors.

WANT TOP RESULTS? TRY PPG!

PPG has a wide range of fiber glass thermal and acoustical insulation products that speed installation, provide excellent insulating properties, give long service life with little or no maintenance. If you haven't tried them, get full information by contacting your nearest PPG Fiber Glass Sales Office, or by writing *Pittsburgh Plate Glass Company, Fiber Glass Division, One Gateway Center, Pittsburgh 22, Pennsylvania.*

FIBER PPG GLASS

PITTSBURGH PLATE GLASS COMPANY

Sales Offices: Atlanta, Boston, Buffalo, Charlotte, Chicago, Cincinnati, Cleveland, Dallas, Denver, Detroit, Houston, Kansas City, Louisville, Los Angeles, Miami, Milwaukee, Minneapolis, New Orleans, New York, Philadelphia, Pittsburgh, San Francisco, St. Louis and Seattle.

WHEN IT'S

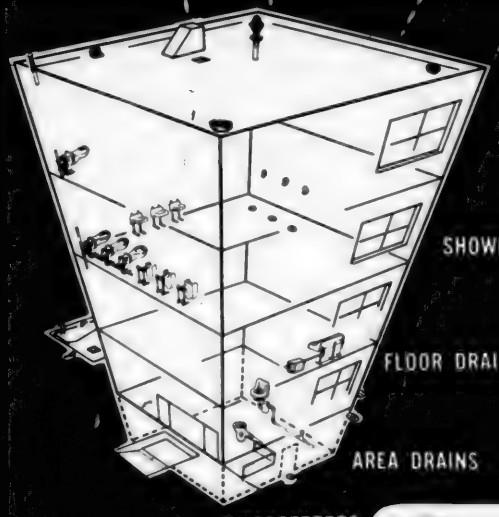
IN YOUR HANDS

TO INSTALL

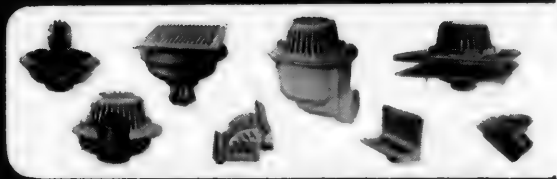
DRAINS

for ANY BUILDING

SPECIFY SMITH



ROOF DRAINS

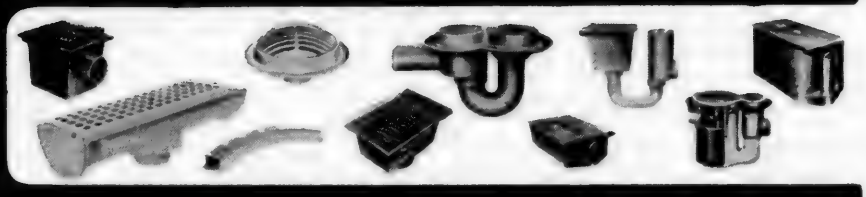


SHOWER DRAINS

FLOOR DRAINS

AREA DRAINS

INTERCEPTORS



OVER 1,000 TYPES, sizes and variations of SMITH Plumb-Easy Drains are made to provide a drain that's just right for every drainage application.

Whenever it's in your hands to install or specify the drains for any building, just consult your local JAY R. SMITH Representative and he'll be glad to help you select the right drain for every job.

CHAIR CARRIERS · DRAINS · INTERCEPTORS · HYDROTROLS

JAY R. SMITH MFG. CO. Union, New Jersey

PLUMB-EASY

a new and better way to

CLEAN AIR

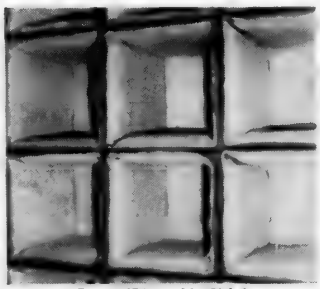
ULOK® Air Filters

Union Carbide research has produced the truly ideal strong, high-capacity filter medium with an irregular, highly-arresting cross section—DYNEL® modacrylic fiber! No other filter medium can touch it for stopping *and holding* unusually large quantities of dust and foreign matter. This dry, un-oiled filter can be vacuum cleaned several times to extend service life even further, if desired.

Proved in scores of major installations—in both new and modified systems—ULOK Air Filters are available in a variety of forms to suit any application.

The Remarkable ULOK Cube-Type Air Filter

Shaped like an open-top box with slightly tapered sides, the ULOK Cube-Type Air Filter with *five filtering surfaces* represents the most efficient filter shape yet perfected. In operation, air flow first carries the dirt particles to the back face of the filter. As dirt collects on the back face, and air resistance increases, air flow is shunted to the four sides, assuring uninterrupted filtration. In addition, the ULOK Cube-Type Air Filter provides far greater filtering surface than conventional filters with equivalent face dimensions . . . and the unique design of the wire basket-type retainers and batt edge assures a tight, leak-proof, press fit.



Front (Dirty Air Side) View of Typical Bank

Rear (Clean Air Side) View of Typical Bank

Advantages: • Up to 600% longer service life over other throw-away filters due to higher dust-holding capacity • 22% to 28% National Bureau of Standards atmospheric discoloration efficiency • Easier installation—filter is light in weight; no sharp edges or "splinters" to hurt hands • Lower labor and maintenance costs; lower inventories because fewer changes are required • Easier disposal—simply collapse and discard—leaving dirt *in the bag* • 14 different sizes suitable for all new, and many existing installations • Only $7 to $13 per 1000 CFM of air covers total costs (except labor).

ULOK Panel-Type Air Filters

Patented method of media formation provides a low-density, three-dimensional batt of high capacity DYNEL modacrylic fiber. Entire face and depth of filter traps dirt particles as inherent strength of medium permits elimination of face supports. Modern ring support provides sure-seal edge and eliminates problem of filter by-pass. Particularly suitable for slide-in applications, and all flat or V-bank installations not adaptable to the Cube-Type Filter. Available in 1″ and 2″ thicknesses, in 9 different sizes, from 10″ x 20″ to 24″ x 24″.

For special applications: ULOK filter media is also available in 2″ Pads, 58″ x 60″. . . in ½″ Rolls, 58″ x 25 yards . . . and in 1″ Rolls, 58″ x 15 yards.

For complete information on ULOK Air Filters, including efficiency and pressure-drop charts, write for new bulletins.

UNION CARBIDE

UNION CARBIDE DEVELOPMENT COMPANY
Division of Union Carbide Corporation
270 Park Avenue, New York 17, N. Y.

ULOK, DYNEL, and UNION CARBIDE are registered trade marks of Union Carbide Corporation

"from Chicago" **For Hot Water Systems, Cold Water Systems, Air Conditioning, General Industrial use**

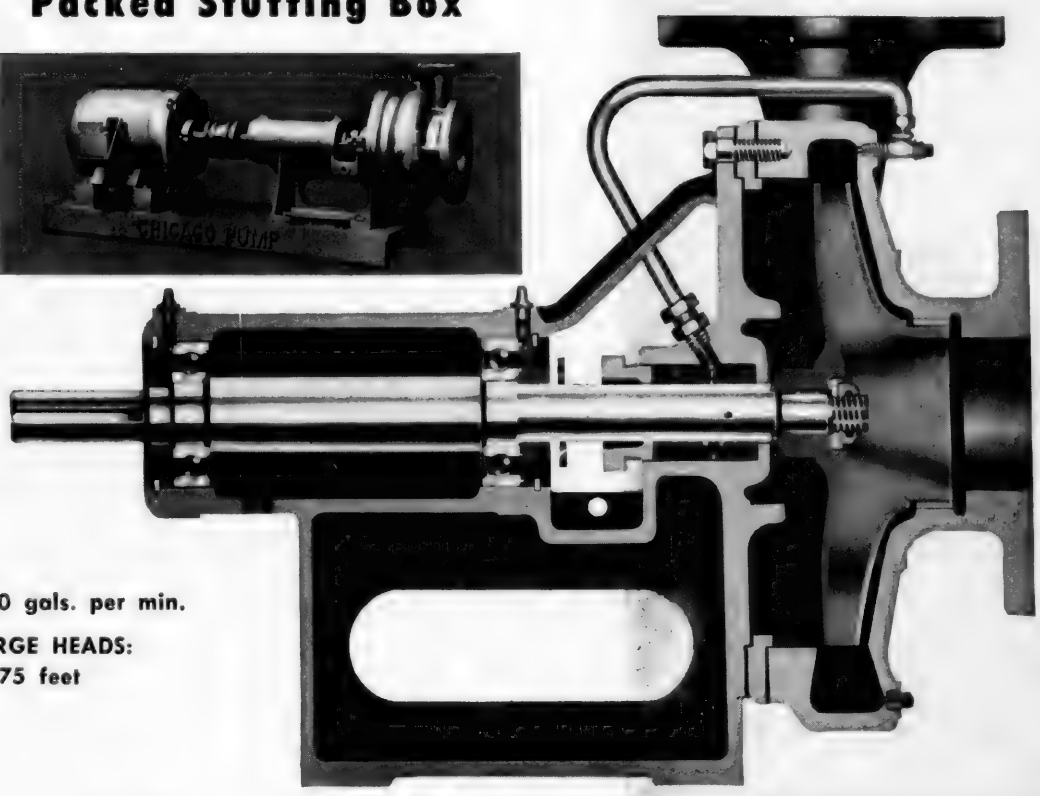
FCP

FLEXIBLE-COUPLED PACKED

CENTRIFUGAL PUMP with Packed Stuffing Box

CHECK THESE 5 "Chicago" FEATURES

1. Designed for hot water heating systems with temperatures to 250° F.
2. Successfully handles impurities normally present in heated and unheated water systems.
3. Quiet operation.
4. Constructed to give efficient, trouble free operation.
5. Backed by more than 50 years experience building quality pumps.



- 5 to 900 gals. per min.
- DISCHARGE HEADS: 10 to 275 feet

Putting Ideas to Work

FOOD MACHINERY AND CHEMICAL CORPORATION
HYDRODYNAMICS DIVISION
CHICAGO PUMP
622J DIVERSEY PARKWAY • CHICAGO 14, ILLINOIS

Write for Bulletins 107 and 107-H

©1961—CP—F. M. C.

"Here's why I standardized on H&M cooling towers

...they're the only towers with a 20-Year Guarantee on the wetted deck surface!

"In my town, most air conditioning and refrigeration buyers prefer cooling towers for their installations. But local water conditions are pretty hard on the fill. Fungus and algae grow fast and furious—so fast that the accumulation actually blocks air flow and cuts tower capacity!

"After trying several makes, I standardized on H&M Cooling Towers. *The wood fill is specially treated with creosote applied under pressure*, and water plants and animals can't live on that! That's why the Halstead & Mitchell towers carry a 20-Year Guarantee on the wetted deck against failure due to fungus attack or rotting."

If you want towers that will last, and need a minimum of care, you should find out about H&M towers. Call your local parts wholesaler or write for Bulletin EC-500 (Propeller Fan Towers, 3 to 150 tons) or Bulletin ECKB-601 (Centrifugal Fan Towers, 5 to 100 tons). Halstead & Mitchell Co., Dept. B-5 Bessemer Building, Pittsburgh 22, Pa.

HM

Halstead & Mitchell

Cooling Towers • Air-Cooled Condensers • Air Handlers and Coils • Water-Cooled Condensers

Export Representatives: Sabal-Kleiman, Inc., 15 William St., New York 5, N. Y.

3 good reasons for specifying the NEW

Fairbanks Morse SPLIT CASE PUMP

1

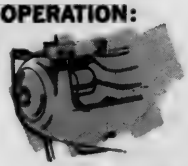
CASING WEARING RINGS:

Maintain high pump efficiency, minimize recirculation past the impeller rim; rings easily replaced when waterborne particles cause wear.

2

MAINTENANCE-FREE OPERATION:

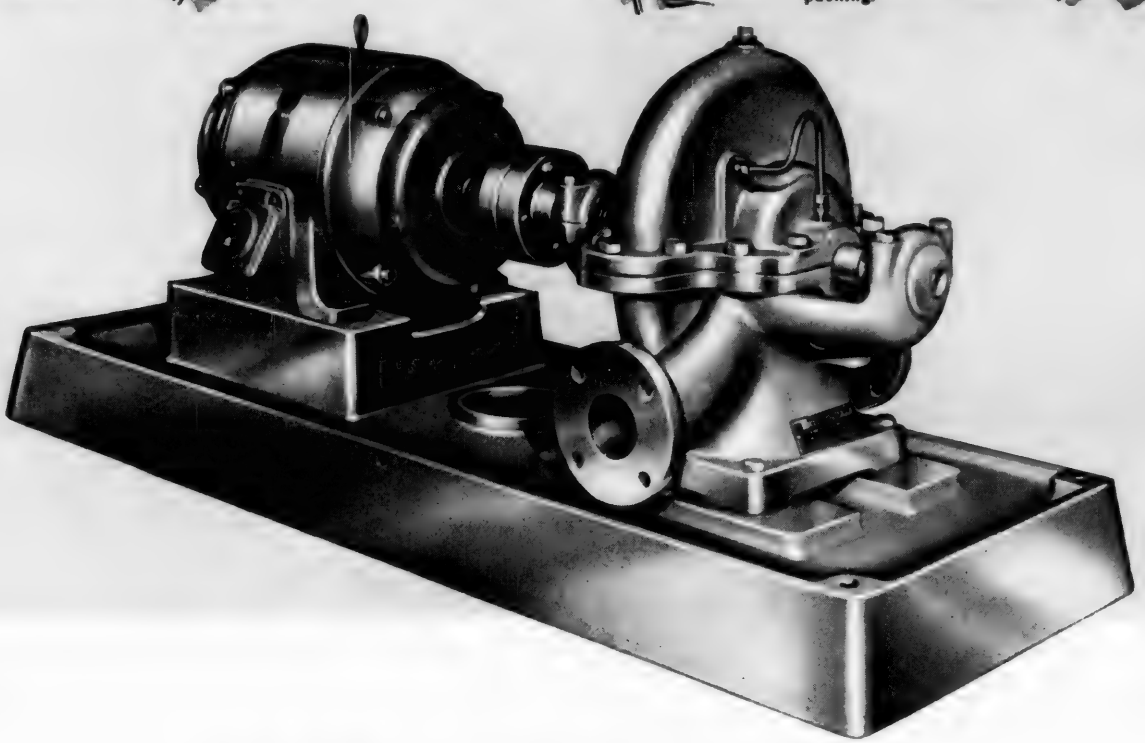
Sealed pre-lubricated bearings require no checking, no lubrication service.



3

SHAFT SEALS OR PACKING:

Optional construction, factory supplied or field conversion, to suit pumping requirements, either mechanical shaft seals or conventional ring-type packing.



A brand new design . . . a brand new simplified concept in Split-Case Pumps. By far, your best buy. Single stage, horizontal Split-Case Centrifugal Pumps—a wise choice for chilled water, circulating or booster duty —cooling towers or general water supply, designed and supplied to you at moderate cost. For further information and factual bulletin #5820, write: **Pump & Hydraulic Div.; Fairbanks, Morse & Co.; Kansas City, Kan.**

FAIRBANKS MORSE

A MAJOR INDUSTRIAL COMPONENT OF

FAIRBANKS WHITNEY

Why Bethcon Galvanized Sheet makes the best ductwork

When you flex a piece of Bethcon galvanized sheet steel, you notice it has a "feel" of its own, a certain extra something. Liveliness, if you will. Toughness, perhaps. Or strength with ductility. Whatever you choose to call it, you'll find that it sinews the Bethcon sheet to form up into a strong, rigid end product.

There's good reason for Bethcon's unique quality. Bethlehem's continuous galvanizing lines include a special annealing cycle which imparts to the basic steel the strength-with-ductility that makes the sheet so desirable. Seconds later, the rich coating of zinc is applied so tightly that it permits forming never considered practical for galvanized steel.

If you have not yet familiarized yourself with Bethcon, you might like to talk to someone who has. Or perhaps you'd prefer to discuss it with one of Bethlehem's representatives. Either way, you'll get prompt attention by getting in touch with our nearest sales office.

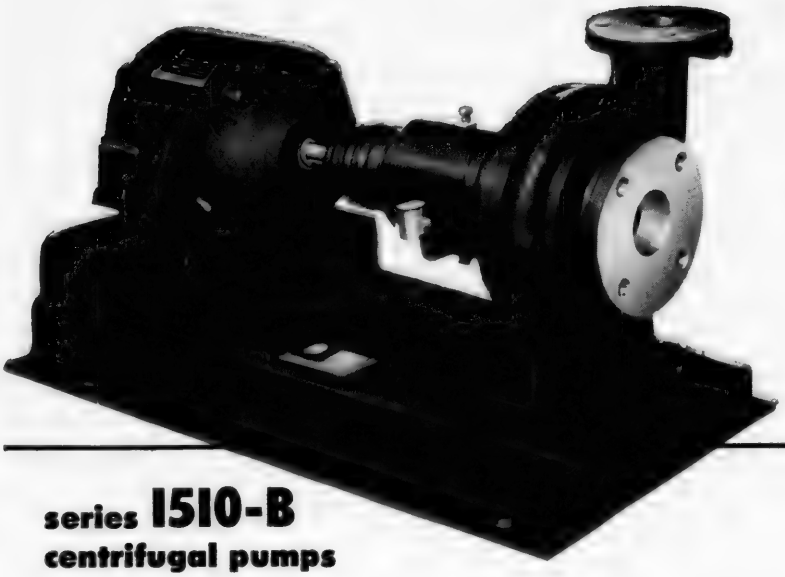
Galvanized Steel

for Strength
. . . Economy
. . . Versatility

BETHLEHEM STEEL COMPANY, Bethlehem, Pa.
Export Sales: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL



NOW AVAILABLE

IN "C" SIZE UNITS UP TO

75 H.P.

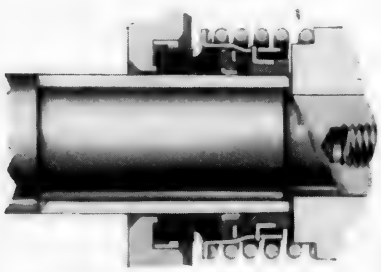
series 1510-B
centrifugal pumps

HIGHER HEADS, GREATER FLOWS AT 1750 RPM!

Now, to its unequalled array of outstanding features, the B&G Series 1510-B Pump adds still another—*a broad range of ratings up to 75 HP*, with capacities to 2000 GPM, heads to 170 ft. and discharge sizes of 3″, 4″, 6″, 8″.

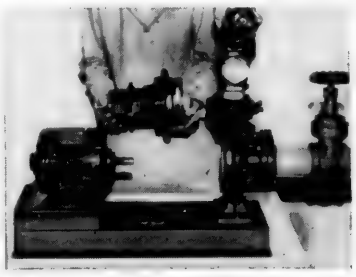
The series 1510-B is a vertical split-case pump designed for smoother, more efficient operation and longer life. Its balanced design enables the bearings to withstand loads far in excess of those developed by any pump and motor combination in the line.

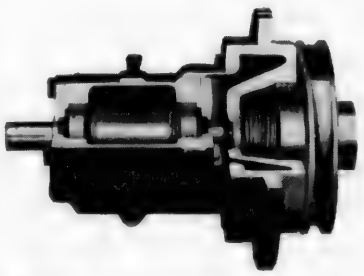
All parts are machined to rigid specifications, carefully inspected and accurately assembled, to insure minimum installation and maintenance expense. Exact uniformity of all parts means easy replacement in the field. All pumps are factory-tested for conditions of head and capacity specified.



LEAKPROOF "REMITE®" SEAL

This exclusive feature assures long, trouble-free life—eliminates the customary leakage which occurs when a packing gland is used. A Carbon Seal Ring faces on a "Remite" floating seat—*a new type of material so hard it will scratch glass—wear-proof and corrosion-resistant.* This Mechanical Seal is self-lubricating. A synthetic rubber bellows seals the shaft. Metal parts are of steel, bronze, or stainless steel, depending upon the type of service.





REMOVABLE BEARING FRAME MAKES SERVICING EASY

The photo shows how easily the complete bearing frame, including the seal and impeller, can be removed without disturbing piping or motor leads. The unit is replaceable and interchangeable in all pump sizes within limits of material construction.

Just five simple steps are required: 1. Loosen coupler set screws. 2. Slide coupler halves back on motor and pump shafts. 3. Remove center drop-out section. 4. Remove volute cover cap screws. 5. Lift out complete bearing frame assembly.

Among the features of the bearing assembly are anti-friction roller bearings to handle thrust and radial loads ...mechanically balanced impeller...oil lubrication.

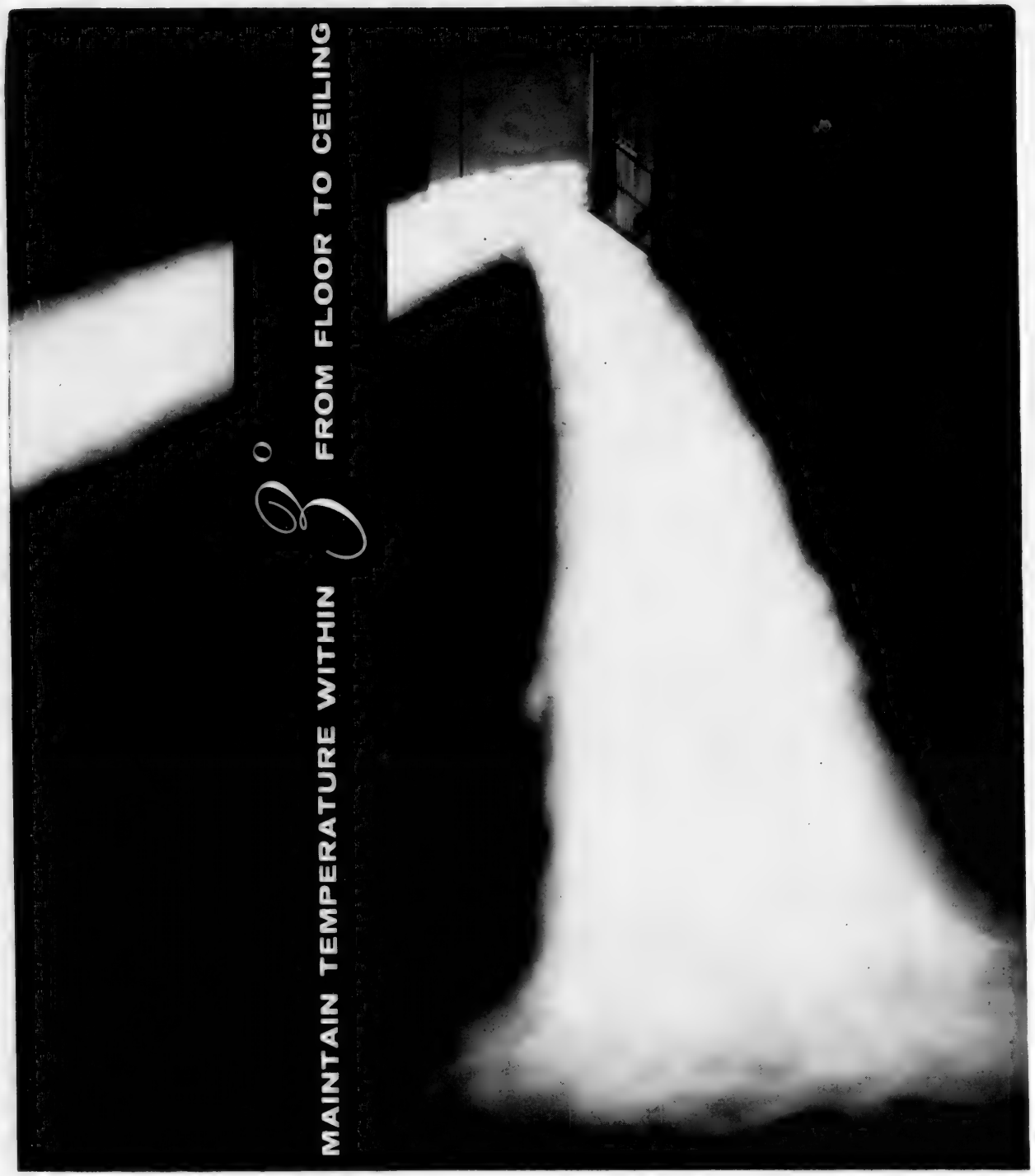
STOCK PUMPS FOR QUICK SERVICE

Selected sizes of B&G Series 1510-B Centrifugal Pumps, as well as Series 1522 and 1531, are stocked at the factory for immediate shipment. Capacities to 225 GPM, heads to 140 ft. Send for Price and Selection Catalog.

BELL & GOSSETT
COMPANY

Dept. GQ-4, Morton Grove, Illinois

Canadian Licensee: S.A. Armstrong, Ltd., 1400 O'Connor Drive, Toronto 16, Ontario



ARKLA-Humphrey

UNIT HEATERS

Arkla-Humphrey Multi-Directional unit heaters are accepting congratulations now. At long last, industry's toughest heating problems have been solved by the Multi-Directional!

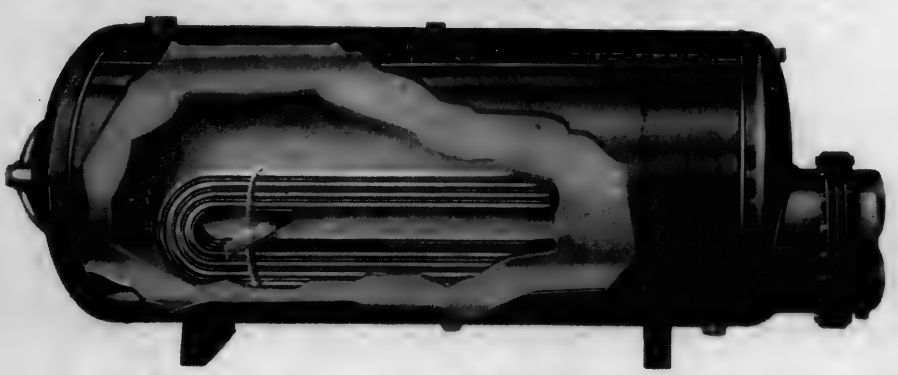
Tests show a 15.38% fuel saving with only a 3° temperature differential from floor to 18' ceiling! Smoke photo above shows you why. The Multi-Directional is the first and only unit heater to discharge heat straight down, out in front, or from either side, or any combination of these three! Pulling the heat from the ceiling with top mounted fans eliminate overheated ceilings, too.

Write for complete information.

MANUFACTURED BY ARKLA AIR CONDITIONING CORPORATION
GENERAL OFFICES SHANNON BUILDING LITTLE ROCK, ARKANSAS

NOW! PRE-KRETE® FACTORY LININGS

Guaranteed



Five Years

UNCONDITIONALLY WITHOUT QUALIFICATION

The Pre-Krete factory-installed lining you specify today will be in perfect condition in 1966 . . . or P-K will repair or replace it free of charge! This new five-year unconditional, *un-prorated* guarantee covers materials and labor. It applies to all factory lined P-K storage water heaters. • After five years? Pre-Krete cures in hot water, gets better as it ages. Chances are it will last almost indefinitely. • A Pre-Krete rust- and corrosion-resistant hydraulic cement lining doubles the life of a plain steel heater, yet costs only slightly more. Special additives make the ¾" coating extra durable. It doesn't chip, crack or flake even at temperatures up to 900°F. And, there are no weak spots or "holidays", because Pre-Krete is always uniform — a result of precision blending. Maintenance costs, of course, are lowered appreciably. • P-K Pre-Krete lined storage water heaters are economical to buy, install and operate. • Designs are advanced in concept and fabrication techniques meet all ASME specifications. • We'll gladly send you our descriptive catalog and more information. Write Patterson-Kelley Co., Inc., 25 Burson Street, East Stroudsburg, Penna.

Patterson Kelley

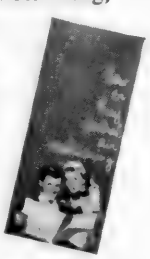
Water Heater Division

Thank you, 74%

Good news! When we surveyed air-conditioning dealers in 21 cities last summer, we found that 74% knew of our Certification program. More important: 6 out of 10 familiar with the program *use it in their selling.*

Thus, in less than two years, air-conditioning dealers have demonstrated their enthusiasm for ARI certification. Many have thought up ingenious ways to sell with the program—and we're delighted.

But we won't rest on our laurels. Dealers kept telling us they'd like a sales piece that would explain the ARI Certification program to their customers, so we designed "How to Buy Central Air-Conditioning." It tells consumers the whys and hows of air conditioning, outlines the Certification program, suggests why air conditioning should not be bought on the basis of price alone. For a sample copy, write (on your letterhead, please) ARI.



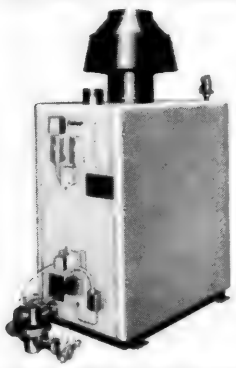
AIR CONDITIONING AND REFRIGERATION INSTITUTE

Department B-512, 1346 Connecticut Ave., N.W., Washington, D.C.

BRYAN BUILDS a boiler for every purpose

Below are shown four basic Bryan Series. Whether you are designing a new school, hospital, office building, motel, or apartment house, one of these (oil or gas fired) will give your client Bryan Copper Tube flexibility, durability and economy.

Meet requirements of A.S.M.E. Code. Gas-fired models A.G.A. Approved.

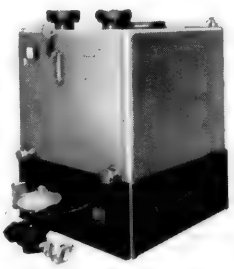


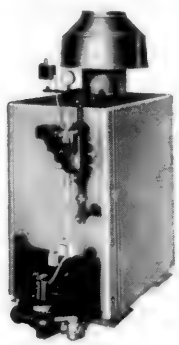
Domestic Heating

BOILERS 9 sizes from 75,000 Btu to 600,000 Btu output. Oil and gas burners are factory installed. Factory wiring is optional. Smaller models available as completely packaged units, with hot water circulation equipment installed.

Commercial Heating

BOILERS 8 sizes from 720,000 Btu to 1,800,000 Btu output, most sizes completely assembled, packaged units, for steam and hot water radiation. Suitable for most schools, churches, apartment houses, office and industrial buildings.



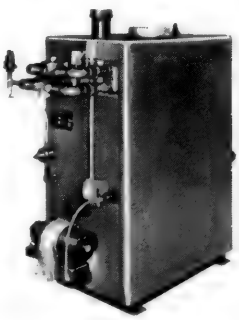


High Pressure

BOILERS Sizes up to 50 hp and up to 125 lb. mwp. Noted for providing steam on short notice and at high efficiency. Particularly fine for hospitals, dry cleaning plants, laundries, dairies, tire repair shops, food processors and others.

Water Heating

BOILERS Sizes from 100,000 Btu to 1,800,000 Btu output. By *indirect* heating, two or more water temperatures can be delivered simultaneously. Used for hospitals, restaurants, laundries, hotels, swimming pools and industry.



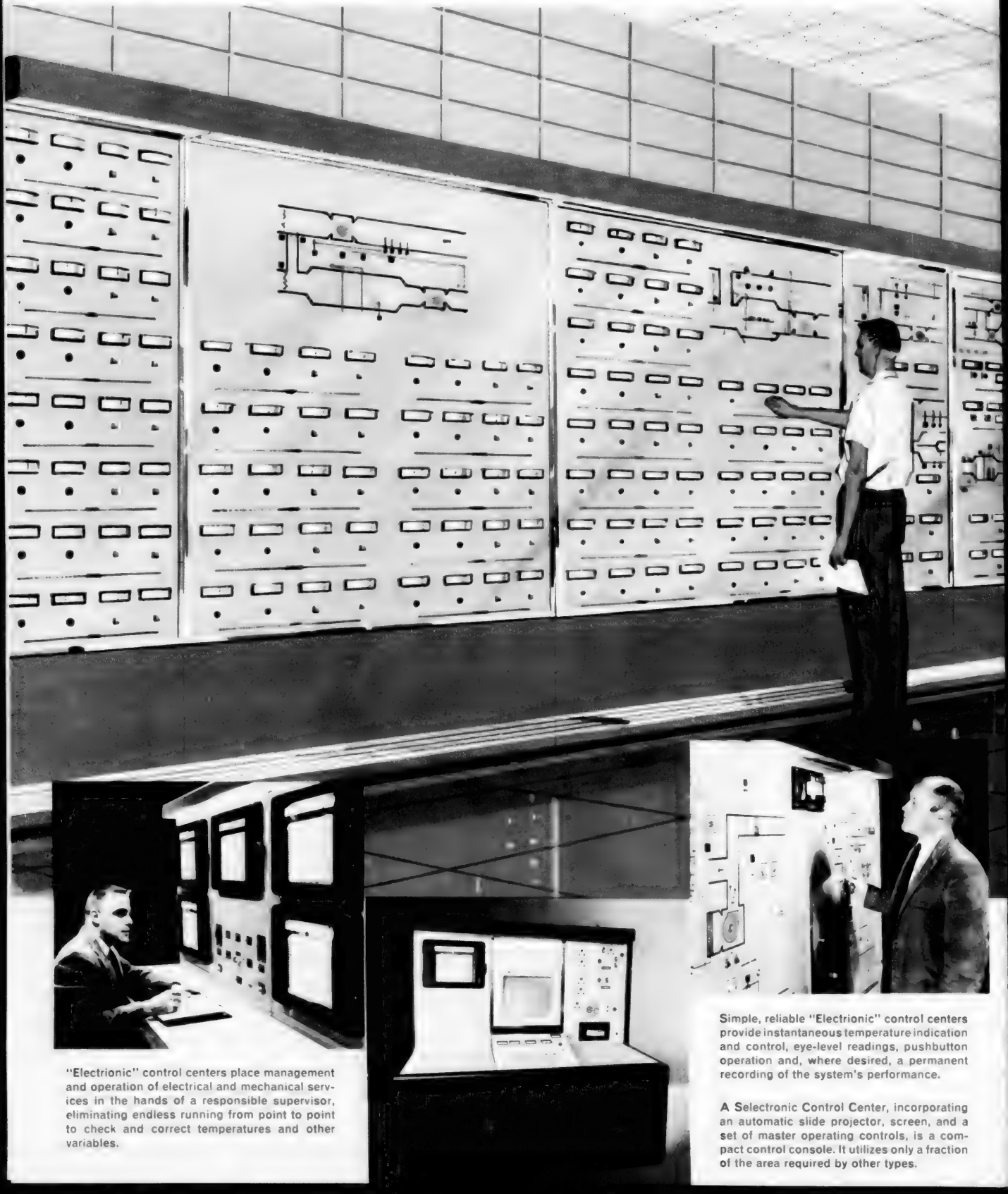
BRYAN STEAM CORPORATION

Bryan COPPER TUBE **Boilers**

CHILI PIKE, PERU, INDIANA

Mastermind for

Chief Architect: Shaw, Metz and Associates • Mechanical Engineer: John Dolio and Associates • General Contractor: Gust K. Newberg Const. Co.



"Electronic" control centers place management and operation of electrical and mechanical services in the hands of a responsible supervisor, eliminating endless running from point to point to check and correct temperatures and other variables.

Simple, reliable "Electronic" control centers provide instantaneous temperature indication and control, eye-level readings, pushbutton operation and, where desired, a permanent recording of the system's performance.

A Selectronic Control Center, incorporating an automatic slide projector, screen, and a set of master operating controls, is a compact control console. It utilizes only a fraction of the area required by other types.

McCormick Place

Complete centralized "Electrionic"® control for 36 million cubic foot "oasis"

You have to think big when you think about McCormick Place, Chicago's new $35-million exhibition hall. It covers almost ten acres, has an exhibit area the size of six football fields, contains a 5000-seat theater.

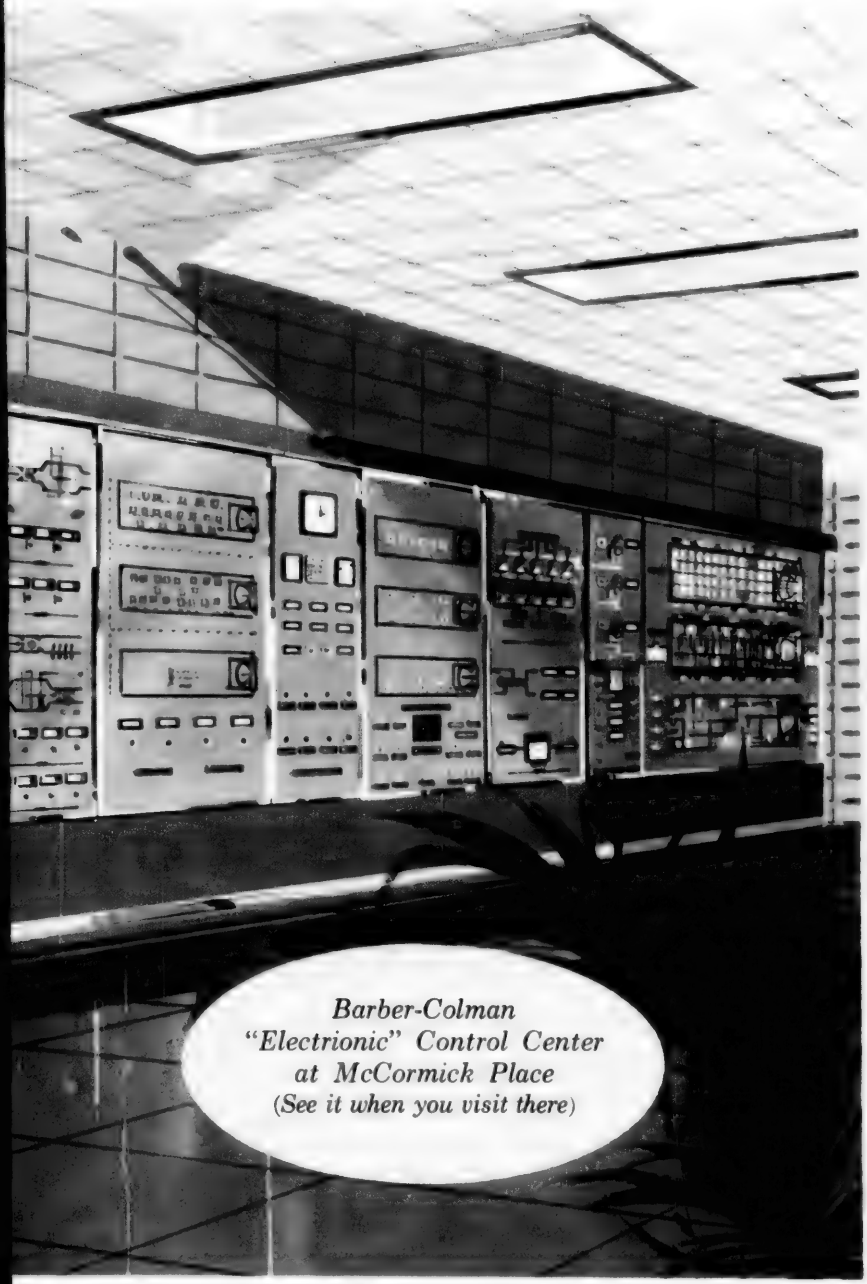
A Barber-Colman "Electronic" Climate Control Center is the brain for the electrical nerve system of this building. It senses temperatures at more than 145 locations . . . reports them at the speed of light . . . corrects for the slightest deviation before you can detect any change . . . creates an oasis of comfort for up to 30,000 people at one time.

The 36-foot-long control panel monitors the entire air conditioning system—fans, dampers, pumps, motors, valves, and other equipment including Barber-Colman high-velocity air distribution control units. It maintains a continuous record of boiler fuel and water consumption.

A part of the panel is given over to lighting control. Here the operator can switch lights on and off anywhere in the building, as well as control their intensity and color to set the mood for any event.

Remote control centers for commercial air conditioning, heating, and ventilating were *originated* by Barber-Colman. Today, after many years of proven application, the Electronic Control Center is the most logical and efficient method of controlling a building's electrical and mechanical functions. There is no building too large or too small to benefit from its economy and reliability.

For complete information, consult your Barber-Colman Automatic Controls field office, or write: *Barber-Colman Company, 1300 Rock Street, Rockford, Illinois.*



Barber-Colman "Electronic" Control Center at McCormick Place (See it when you visit there)

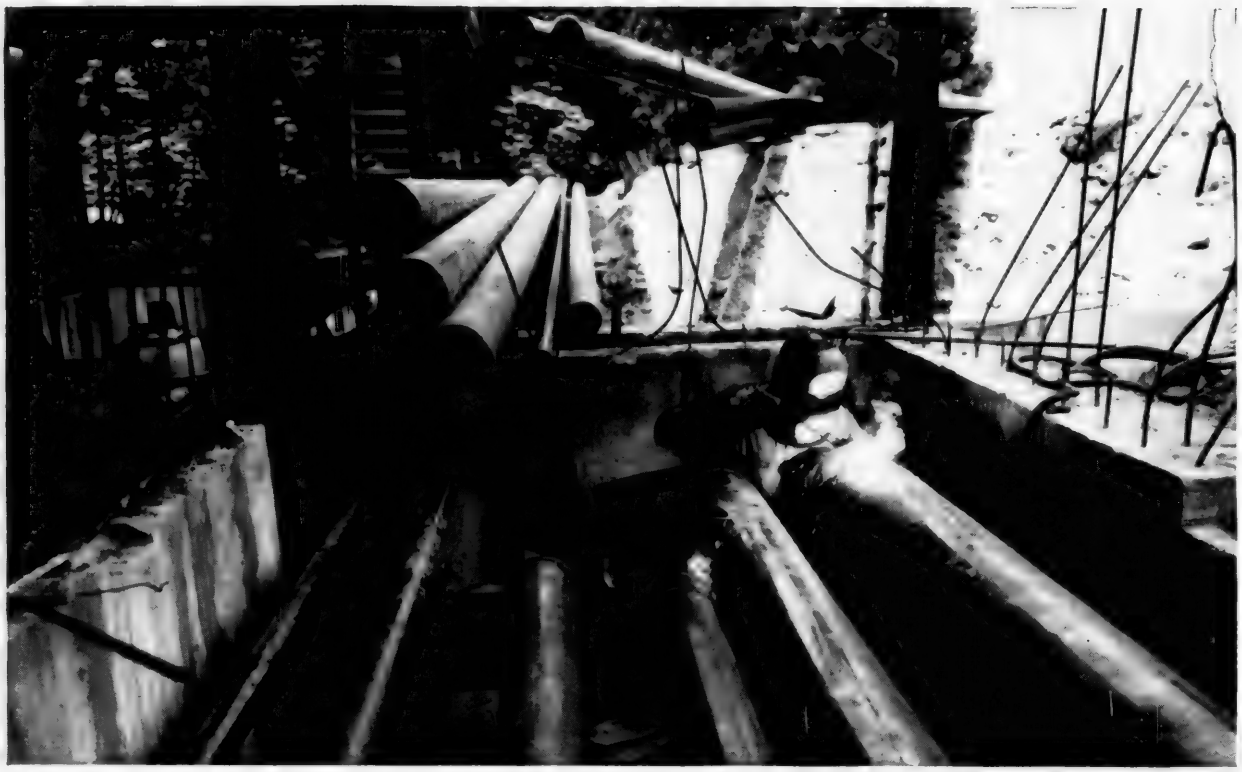
BARBER-COLMAN

. . . where originality works for you

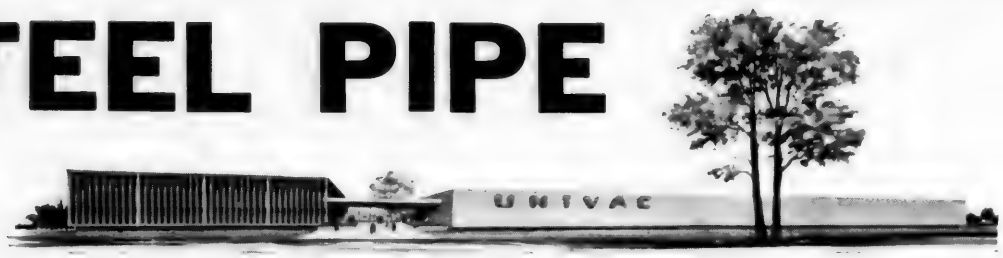
Ask for new brochure F-8031-1 which describes the benefits of centralized remote control centers and explains the unique advantages of the Barber-Colman "Electronic" system.

BARBER COLMAN

KEEP PACE WITH ELECTRICALITY



STEEL PIPE



for the ultra-modern Univac® building

OWNER
Remington Rand Univac, Division of Sperry Rand Corp
ARCHITECT & ENGINEER
The Ballinger Company
GENERAL CONTRACTOR
Wark & Company
MECHANICAL CONTRACTOR
John C. Kohler Co.
PIPE JOBBERS
Cooney Bros., Inc.
D. N. Supply Co. of New Jersey
J. Levitt, Inc.
Pesco Pipe & Supply Co.

This striking new computer-engineering center, just outside Philadelphia in Blue Bell, houses almost 1,000 people in some 2½ million cu ft of air-conditioned space. Automatic solar controls, operating vertical louvers on the south facade of the office building help to minimize the air-conditioning load. Some 165 tons of Bethlehem steel pipe were required for the heating and air conditioning alone. Drainage and vent lines, too, are made up of Bethlehem pipe.

When you compute piping costs for that next job, the odds are good your answer will point to steel as the most economical piping. Steel pipe combines low cost with durability. Its strength is unexcelled for safety: yet, it is readily weldable, and cuts and threads easily for fast installation. There's steel pipe for every purpose, and it's available everywhere from stock.

And be sure to insist on *steel* pipe Made in U.S.A.

Steel

For Strength
. . . Economy
. . . Versatility

BETHLEHEM STEEL
BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
Export Sales: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

In the RUSH months coming up

INSIST ON

genetron®

SUPER-DRY REFRIGERANTS

The remarkable dryness and purity of "Genetron" Refrigerants always pay off in dependable, trouble-free performance. That's why "Genetron" Super-Dry Refrigerants are accepted, approved, and *preferred* both for original equipment and replacement charging.

"Genetron" fluorinated hydrocarbon refrigerants are *right*—and they are *ready*. Your "Genetron" wholesaler has them in stock, and is prepared to supply your needs ...in a hurry! Ask him, too, to show you the new "Genetron" Kit for field testing hermetic burnouts and the new pressurized "Genetron" 11 solvent cylinders for cleaning mildly contaminated systems after burnout.

genetron 11 CCl_3F ORANGE LABEL
TRICHLOROMONOFLUOROMETHANE

genetron 12 CCl_2F_2 WHITE LABEL
DICHLORODIFLUOROMETHANE

genetron 22 $CHClF_2$ GREEN LABEL
MONOCHLORODIFLUOROMETHANE

genetron 113 $C_2Cl_3F_3$ PURPLE LABEL
TRICHLOROTRIFLUOROETHANE

genetron 114 $C_2Cl_2F_4$ BLUE LABEL
DICHLOROTETRAFLUOROETHANE

GENERAL CHEMICAL DIVISION
40 Rector Street, New York 6, N.Y.

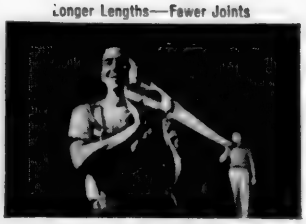
Allied Chemical

LIGHTWEIGHT COPPER TUBE IS EASY TO INSTALL. Only *one fourth* the weight of ferrous materials—one man lifted and connected this long length of 6-inch copper drainage tube. Overhead work is easier with Anaconda copper tube—no heavy equipment for threading or caulking. In close quarters, copper tube and solder-joint fittings make light work out of tight work. Use this lightweight modern drainage tube—Anaconda copper tube—for your next drainage installation. For more information on copper tube, write: Anaconda American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.

ANACONDA

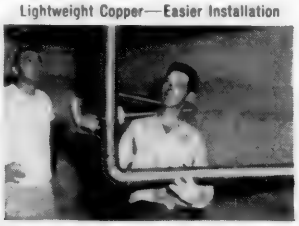
COPPER TUBE AND FITTINGS for soil, waste and vent lines
Available through plumbing wholesalers. Products of Anaconda American Brass Company

Longer Lengths—Fewer Joints

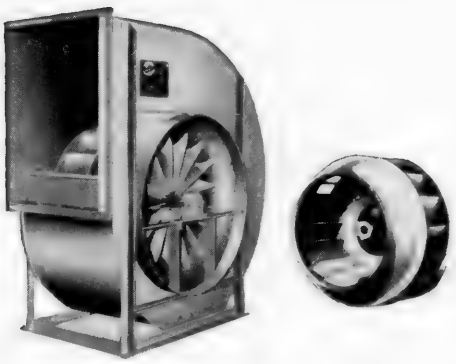


Preassembly—Saves Time

Lightweight Copper—Easier Installation



Compact Connections—Save Space



Put

'BUFFALO' BL

on your

next job...

BACKWARD CURVED BLADES provide high efficiency plus stable performance over the full capacity range

PROPERLY CURVED WHEEL SHROUD assures proper air flow in wheel

INLET BELL WITH INLET GUIDE VANES matches curve of wheel shroud for smooth, quiet entry path

EASY DUCT CONNECTION provided by ample inlet collar

NON-OVERLOADING! Select motor to h.p. rating without fear of over-loading

MANY OPTIONS — inlet and outlet dampers, high-temperature and/or non-sparking construction, special anti-corrosion coatings and materials

and

RELAX

It's the most proven, efficient fan in Class I and II construction.

Because of exclusive 'Buffalo' design and construction features, you can't buy a better or more reliable air supply for your ventilation or air conditioning system!

QUALITY CONSTRUCTION for a long, trouble-free service life.

WRITE FOR BULLETIN F-104-A and see why the 'Buffalo' BL is your ideal air supply on any Class I or II job!

AIR HANDLING DIVISION

BUFFALO FORGE COMPANY

Buffalo, New York

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

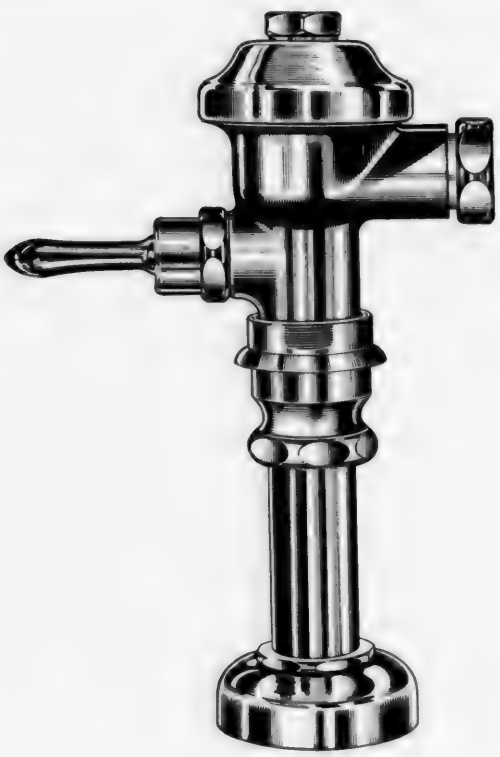
'Buffalo' Air Handling Equipment to move, heat, cool, dehumidify and clean air and other gases.

'Buffalo' Machine Tools to drill, punch, shear, bend, slit, notch and cope for production or plant maintenance.

'Buffalo' Centrifugal Pumps to handle most liquids and slurries under a variety of conditions.

Squier Machinery to process sugar cane, coffee and rice. Special processing machinery for chemicals.

If there is ever a better flush valve . . . its name will be SLOAN



1951

1961

You can't always SEE product improvements

At first glance, the latest Sloan ROYAL Flush Valve looks much like its predecessor. Same gleaming nickel-chrome finish, same expert workmanship, same smart appearance. But if you could see inside, where flush valve performance counts, you would find product improvements that make the 1961 ROYAL the standard by which all other flush valves are judged.

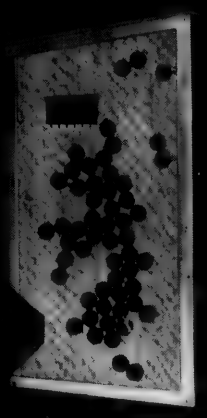
Product improvement that is more than just "skin deep" has been the keynote to Sloan leadership for over half a century. Sloan strives constantly to build its flush valves even better, adopting changes only after thorough experimentation and field testing.

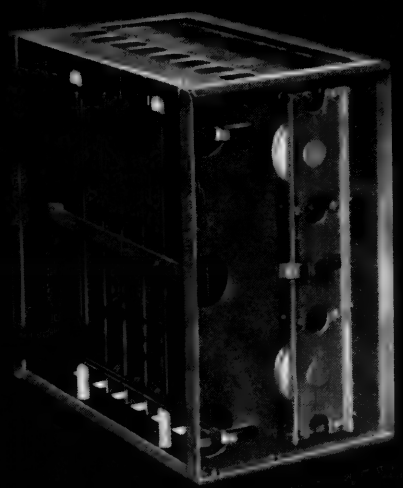
Here are a few of the engineering firsts that continue to sustain Sloan leadership: no regulation; non-hold-open; segment diaphragm; inside cover; and use of Du Pont Delrin® for some parts.

These, and other features, are the bonus of quality you expect with the ROYAL—the finest flush valve ever made.

SLOAN FLUSH VALVES

SLOAN VALVE COMPANY • 4300 WEST LAKE STREET • CHICAGO 24, ILLINOIS





Electronic air cleaning traps the expensive dirt

Minute particles of dust, dirt, smoke and bacteria...of less than 1 micron in size...pass right through mechanical filters. This is the dirtiest airborne dirt. The most expensive dirt. It soils walls, merchandise, lighting fixtures. Wears out moving parts. Shorts out motor windings. Contaminates foods, drugs, paints, chemicals. Causes malfunctions in electronic and precision equipment. Ordinary mechanical filters cannot trap this dirt.

But with PRECIPITRON® electronic air cleaners you trap all dirt sizes ...including the damaging minute particles as small as 1/100 micron. With PRECIPITRON you can cut down housekeeping expense, product rejects, wear on equipment, and contamination...by trapping the expensive dirt that filters cannot catch. Yet PRECIPITRON is less expensive to own and maintain.

Talk to your consulting engineer. Or call in Sturtevant application engineers. They're experts in handling air...whether you want to move it, heat, cool or clean it.

WESTINGHOUSE ELECTRIC CORPORATION
Sturtevant Division, Dept. EV19.
Hyde Park, Boston 36, Mass.

Send me your Precipitron brochure.

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J-80719

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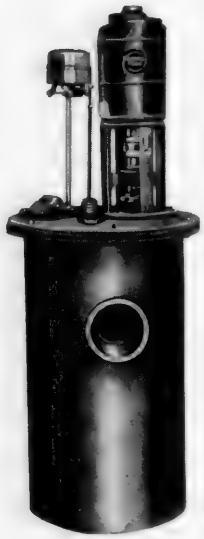
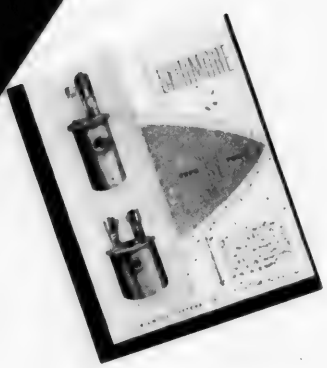
You can be sure...if it's **Westinghouse**

Specify Skid



TYPE UV

Designed for return of condensate to the boiler or other points from all types of steam heating systems or process equipment. The UV pump features a NEW wide range of pump types, sizes, capacities and pressures. Pump can be installed with the receiver underground and the receiver cover plate flush with the floor. Manufactured in both the single and duplex units. Pump unit is bronze fitted throughout.



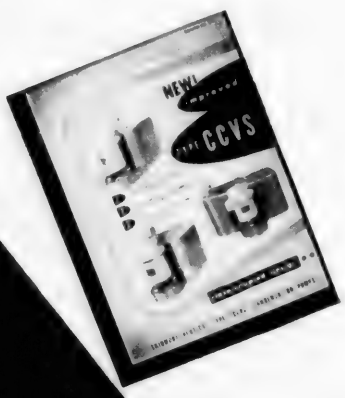
WRITE FOR YOUR COPY OF BULLETIN No. 19-B

2 New Bulletins

WRITE FOR YOUR COPY OF BULLETIN No. 21-C

TYPE CCVS

High pump efficiency with a minimum motor size . . . the CCVS vertical pump features close-coupled design and mechanical shaft-seal. Complete pump and motor unit is bolted to receiver. Manufactured in both single and duplex units, pump can be installed on floor level or in pit. There are three new single units and two duplex units offering a choice of two float switches or automatic alternator in the duplex units.

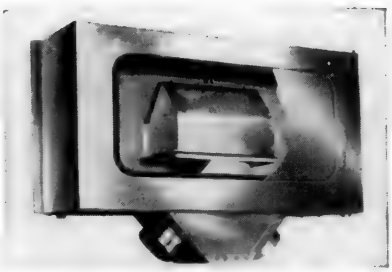


SKIDMORE C MICHIGAN

1,394 windows in the roof

This is the "doghouse" in every Dual Duct air mixing unit. Quietly and efficiently, its 1,394 window-like apertures are opened and closed automatically to maintain constant air volume regardless of static pressure variance. That means there's never a balancing problem, never a drop-off or sudden air blast resulting from activity or shut-down in other zones.

For new structure or modernization, Buensod Dual-Duct is the perfect year-'round air conditioning system . . . completely compatible with existing radiation, too.



Buensod-Stacey Type V, Under-Window Dual Duct air mixing unit.

BUENSOD-STACEY CORP. · MANUFACTURED PRODUCTS DIVISION

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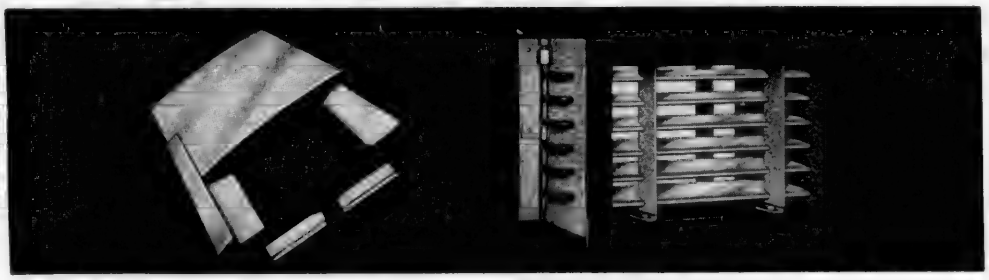
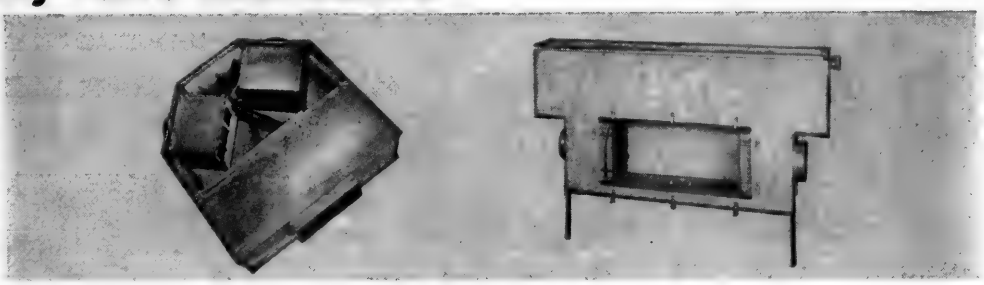
PNEUMAVALVE—a contribution made only by Connor—adapts with equal facility anywhere that air must be controlled. Needs neither mechanical linkage nor operators. Response is instantaneous, positive, linear. No hysteresis. Minimum turbulence. A range of sizes. Bulletin K-45.



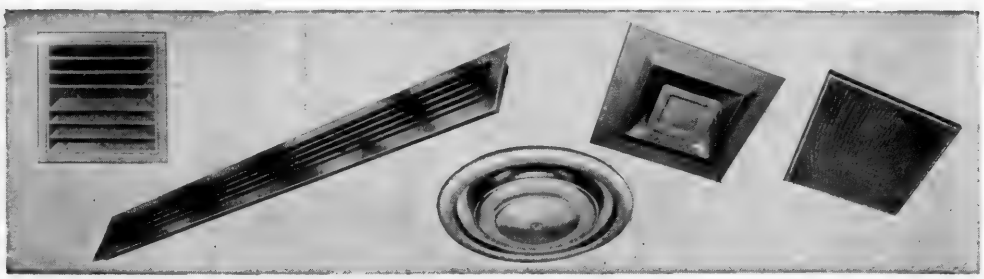
high velocity valve attenuators

At the heart of every model in Connor's Series 45P line is PNEUMAVALVE, the exclusive element that makes this Series superior for fault-free, ultra-quiet, minimum-maintenance performance. Shown are the DPC total constant volume Ceiling unit, left, and the unique DPW total constant volume Under-Window Sill-Slot unit. Bulletins K-33A, K-46, K-52, 31F.



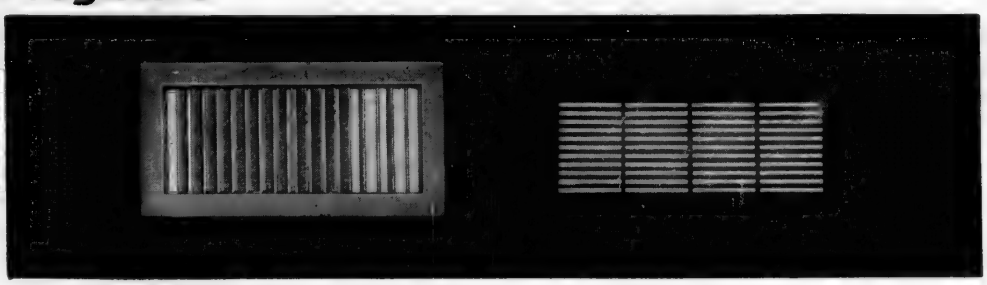
air diffusers

Shown are representative models in the complete Kno-Draft air diffuser line . . . adjustable and fixed pattern. Smart, simple styling that blends perfectly, unobtrusively with any interior, most recent additions are the KSS multi-pattern diffuser, extreme left, and the KO perforated diffuser, extreme right. Bulletins K-20A, K-27A.



grilles and registers

The extensive Kno-Draft line of grilles and registers offers a wide variety of face designs and rectangular configurations. Units that permit two-directional air flow, positive air volume control, other desirable features are available. Bulletin K-40.



CONNOR

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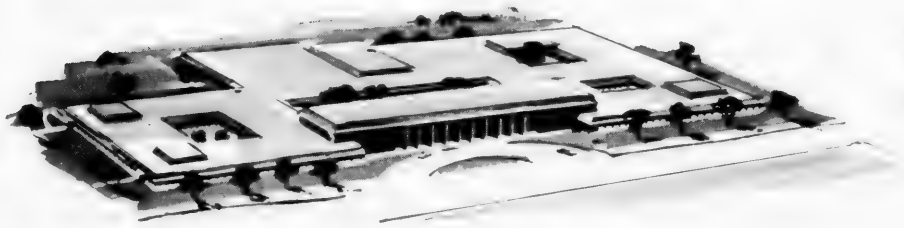
AIR DIFFUSERS

Edward Ross, President, Economy Plumbing Co., Mechanical Contractor for the Pure Oil Building, Palatine, Illinois, says:

"Pure Oil was an elaborate Honeywell helped

Mr. Edward Ross of Economy Plumbing. Mr. Ross found the Honeywell Selectographic Data-Center of great help in analyzing the performance of Pure Oil's temperature control systems.

job, but
us over the rough spots"



ARCHITECTS: *Perkins & Will, Chicago*
CONSULTING ENGINEER: *E. R. Gritschke Assoc., Chicago*
MECHANICAL CONTRACTOR: *Economy Plumbing Co., Niles, Ill.*

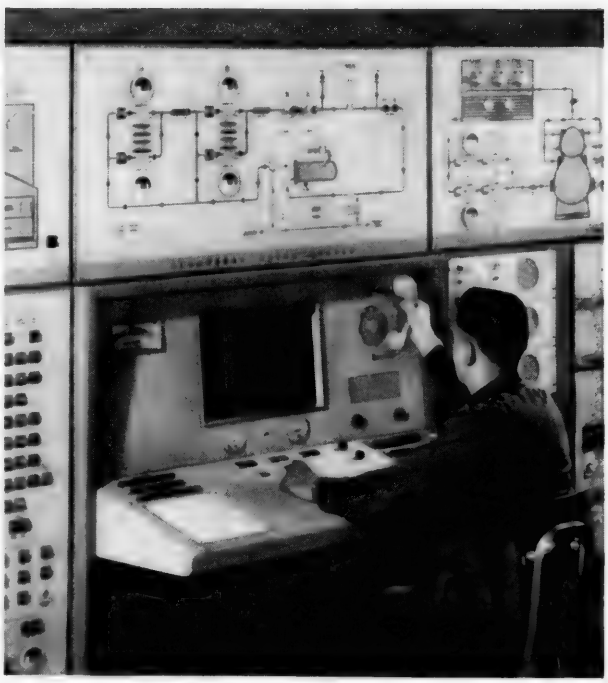
At Pure Oil's new home, individual temperature control in over 400 rooms is maintained and constantly supervised by a Honeywell Selectographic DataCenter*.

"This new Pure Oil Building has one of the most intricate temperature control systems we've ever seen," says Mr. Ross. "In fact, there are more individual controls than in 99% of the systems built today." Mr. Ross adds: "We counted on Honeywell for accurate scheduling and over-all supervision of the installation—and they came through! Honeywell always had enough engineers and technicians on the job to keep everything rolling smoothly. It's very reassuring to know Honeywell's on your team."

The Honeywell Selectographic DataCenter controls temperatures for the entire Pure Oil Building. It also includes control over a building-wide security system and fire alarm system. Because the fire alarm system is hooked up to the local fire department, one of Honeywell's many jobs was to indoctrinate the Palatine Fire Department on the Selectographic and the new fire alarm system.

With 76 years experience in temperature control you can depend on Honeywell quality and service. Fine controls, accurate specifications, prompt delivery and expertly supervised installations are assured with Honeywell on your team. And only Honeywell designs and manufactures all three types of control systems—pneumatic, electric and electronic. For further information, call your nearby Honeywell Office. Or write Honeywell, Dept. HV-5-126, Minneapolis 8, Minn.

**Trademark*



Fred Heiden, Utility Operator for the Pure Oil Building, seated at the Selectographic DataCenter.

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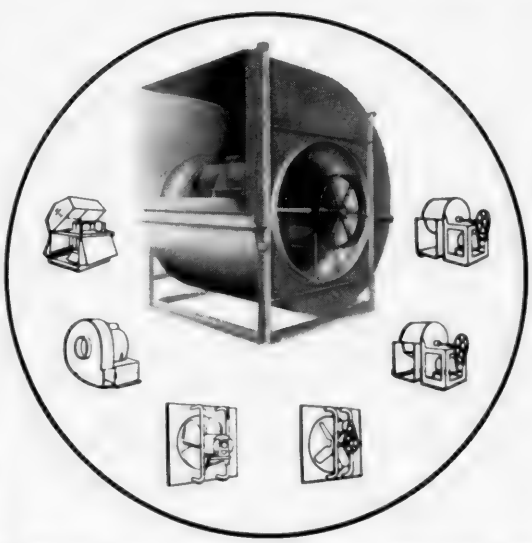
Investigate Peerless Air Moving Equipment Today! Write to Peerless Electric Division, H. K. Porter Company, Inc., West Market Street, Warren, Ohio.



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PORTER SERVES INDUSTRY with steel, rubber and friction products, asbestos textiles, high voltage electrical equipment, electrical wire and cable, wiring systems, motors, fans, blowers, specialty alloys, paints, refractories, tools, forgings and pipe fittings, roll formings and stampings, wire rope and strand.

Member—Air Moving and Conditioning Association, Inc.

An All Ambient

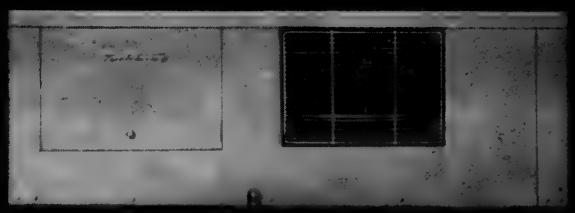
* *Experiencing nuisance trip-outs when operating your air cooled condensing unit below 60° F outside?*

* *Desire an air cooled condensing unit that assures consistent operation in outside temperatures to 120° F?*

* *Is your condensing unit-evaporator balance critical when operating through a wide range of outside ambients?*

* *Concerned about dangerous freon migration during low outside ambients?*

* *Looking for an all ambient air cooled condensing unit to meet your humidity control requirements?*



PIONEERS AND LEADERS IN AIR CONDITIONING COMFORT

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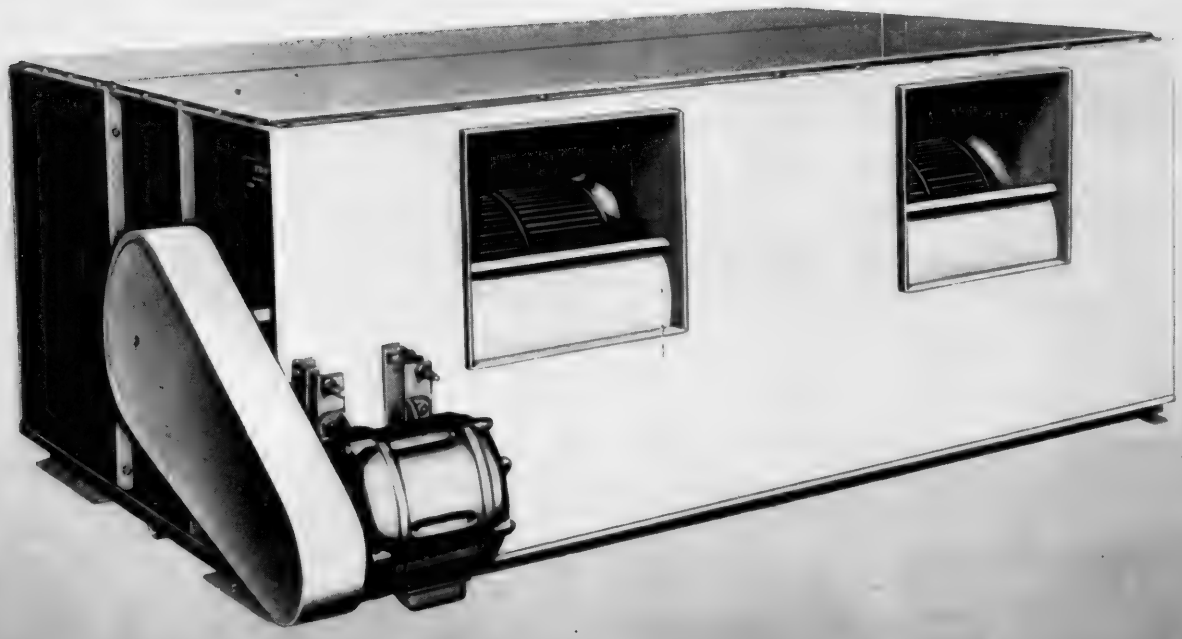
You'll solve more with Trane Central



Here's why TRANE Climate Changers solve more difficult application, installation and maintenance problems:

- **Compactness.** Substantially reduced dimensions solve problems of limited installation space while maintaining top performance.
- **More sizes.** For efficient application flexibility, there are 14 sizes in the Standard (draw-through) type, and 13 sizes in the Multi-Zone double duct (blow-through) type. Each type covers the range of 6 to 63 sq. ft. coil face area.
- **Reliable ratings.** TRANE Climate Changers are fully tested and accurately rated as complete assemblies.
- **Exclusive one-inch O.D. tube non-freeze steam coil.** Provides uniform leaving air temperature over full face area of coil down to 6 per cent of full loading.
- **Exclusive Multi-Zone damper design** provides positive all-round seal for both hot and cold decks to eliminate leakage.
- **Life-lubricated ball bearings** prevent start-up damage due to improper on-the-job lubrication procedures. Eliminates time-consuming lubrication maintenance.
- **Improved mixing box** and damper design assures complete mixing of outside and return air, eliminates stratification.
- **Complete fan assembly electronically balanced** in unit before shipment, assures unit will operate without vibration.

Advanced engineering features assure high performance of Trane Coils!

The TRANE Sigma-Flo Fin design increases heat transfer efficiency. Casing design reduces over-all dimensions, eliminates air by-passing the coil, minimizes moisture carry-over on dehumidifying coil. Heating coils feature a non-freeze design with one-inch O.D. tubes as standard. The cooling coil line features an all-purpose coil, a completely drainable coil, a completely cleanable coil and a direct expansion coil. Sigma-Flo Fins have S-shaped contours to assure uniform air turbulence over the *total* fin. The result is high heat transfer efficiency. Tubes are mechanically expanded into wide fin collars to provide a permanent solderless bond.

These advanced engineering features are yours in *standard* TRANE Coils—priced competitively with conventional coils! Ask your nearby TRANE Sales Office for complete facts on these coils—and about the cooling coil selection method (exclusive with TRANE) that saves time, assures unparalleled pinpoint accuracy!

air handling problems Station Climate Changers!

Superior versatility. Unmatched flexibility. Wider range of sizes. And, an advanced coil design, exclusive with Trane!

Here is the latest advance in central station air conditioners: TRANE Climate Changers, with exclusive engineering features, quality built throughout. These units are highly compact, have unequaled versatility; and there are over 100 standard units to enable you to meet the exact requirements of any job more accurately.

You can select TRANE Climate Changer units, step-by-step, to meet the most exacting job specifications. The result is a system of perfectly matched components to meet your specific air conditioning requirements. There are draw-through and Multi-Zone models—available in both medium and low-pressure types, in a widened range of capacities from 1,200 to 47,000 cfm.

Ratings for consistent and accurate performance of TRANE Climate Changers have been established after nearly 30,000 man hours of engineering, research and testing.

The Climate Changer fan assembly is electronically balanced before shipment to provide greater protection against vibration.

Next time you're planning a job calling for a central station unit, ask your nearby TRANE Sales Office for complete facts on the Climate Changer line. Or, if you prefer, write directly to TRANE, La Crosse, Wisconsin.

For any air condition, turn to

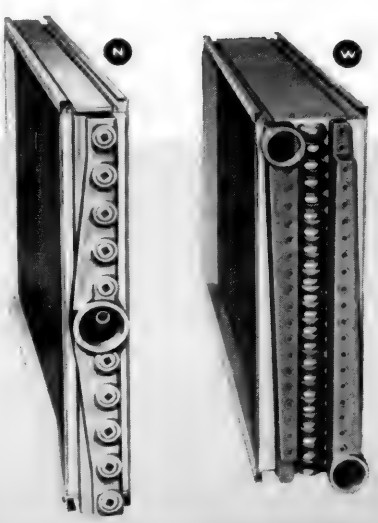
TRANE

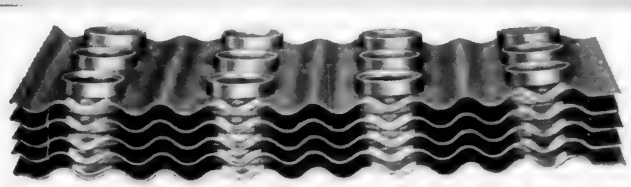
MANUFACTURING ENGINEERS OF AIR CONDITIONING, HEATING, VENTILATING AND HEAT TRANSFER EQUIPMENT

THE TRANE COMPANY, LA CROSSE, WIS. • SCRANTON MFG. DIV., SCRANTON, PA. • CLARKSVILLE MFG. DIV., CLARKSVILLE, TENN. • TRANE COMPANY OF CANADA, LIMITED, TORONTO • 100 U. S. AND 19 CANADIAN OFFICES

Type N steam coil, non-freeze design, with one-inch O.D. tubes that provide uniform temperature distribution across coil face. Positive protection against freeze-up.

Type W all-purpose water cooling coil, from return end. Rugged cast-iron headers with hydrodynamic design provide most efficient flow distribution, assure uniform distribution to all tubes and minimum pressure drop.





New Sigma-Flo Fin features wavy design that improves heat transfer efficiency, results in more compact design. Fins, die-formed in multiple stages, provide accurate tube fits and fin bonding spacing.

Books to Help You in PIPING AND PLUMBING

HANDBOOK OF AIR CONDITIONING HEATING AND VENTILATING
INDUSTRIAL HEAT TRANSFER
Design of Plumbing and Drainage Systems
Fluid Flow in Pipes
By Clifford McClain
Methods of Joining Pipe
PIPEFITTERS HANDBOOK

HANDBOOK OF AIR CONDITIONING, HEATING AND VENTILATION. Edited by Clifford Strock. 1094 pages, 518 tables, 598 illustrations. A wealth of working data for design engineers in piping and plumbing, heating, ventilating, air conditioning and related fields. 136 pages are devoted to piping and plumbing, including such subjects as: Fluid Flow Equations, Viscosity of Liquids, Dimensional and Capacity Data for Pipe, Plastic Pipe, Pipe and Fitting Standards, Expansion of Pipe, Corrosion Resistance of Metal Pipes, Water Hardness and pH Values for U. S. Cities, Pipe Support Spacing, Valves, Cold Water Requirements, Cold Water Pipe Friction Charts, Steam Flow in Pipes, Gas Piping for Buildings, Centrifugal Pumps and Estimating Sewage Quantities. **$15.00**

FLUID FLOW IN PIPES. By Clifford H. McClain. 124 pages, 18 illustrations. Explains and clarifies the processes involved in the flow of liquids and gases through pipes and ducts. Shows how to handle viscosity, friction, turbulence, head and other factors, and illustrates the overall influence of each. Theory, measurement, dimensions of viscosity, and the units of evaluation are carefully explained. **$4.00**

DESIGN OF PLUMBING AND DRAINAGE SYSTEMS. By Louis Blendermann. 328 pages, 201 illustrations. Covers whole field of modern plumbing practice and design. Basic problems for conventional systems as well as highly specialized problems are discussed thoroughly. An authoritative, encyclopedic coverage of this field. **$7.00**

INDUSTRIAL HEAT TRANSFER. By F. W. Hutchinson. 336 pages, 136 illustrations and charts. 123 time-saving graphs give direct solutions to the most commonly encountered problems of heat transfer. These accurate graphs eliminate calculation and error. Covers forced convection of gases and liquids, whether heating or cooling, while flowing within or outside of pipes. Graphs are provided for 70 industrially used liquids and gases. **$7.00**

PIPEFITTERS HANDBOOK. By Forrest R. Lindsey. Enlarged Second Edition. 416 pages, 248 illustrations. Written especially for pipefitters by a pipefitter. Answers problems of pipe bending, layout and installation directly. All techniques are covered. Tables of standard dimensions, laying lengths, etc. simplify layout and installation. Contains complete data on plastic pipe, spacing of pipe supports, expansion of pipe, how to make templates, etc. Provides help for every job—in the shop or in the field. Fully indexed. Bound in flexible Fabrikoid. Pocket-size. **$6.00**

METHODS OF JOINING PIPE. By J. E. York. 236 pages, 249 illustrations. The advantages and disadvantages of joints used for connecting both metallic and non-metallic pipe lines. Data on joints designed to take up movement due to expansion and contraction. Details for standard and special applications. For all who are concerned with the design and installation of satisfactory piping systems. **$4.00**

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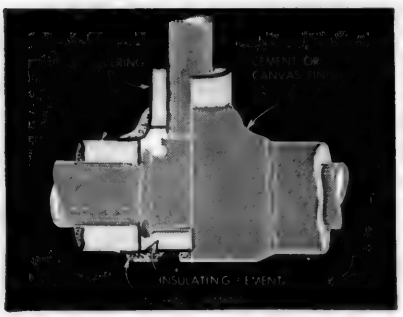
Suggested specifications for insulating VALVES and FITTINGS with G-B SNAP*ON® Glass Fiber PIPE INSULATION

DESCRIPTION

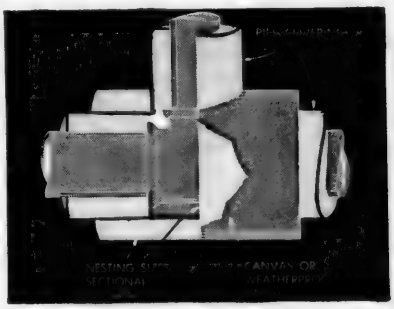
To cut the cost of insulating valves and fittings, try the insulation that is easily custom-cut with a pocket knife—G-B Snap*On, the original one-piece hinged pipe insulation molded entirely of fine glass fibers. Not only can workmen cut G-B Snap*On to fit around valves and fittings faster, but specifiers are assured of maximum insulation protection against heat loss or heat gain. In fact, G-B Snap*On offers "K" factors that are second to none among all general purpose pipe insulations. What's more, G-B Snap*On is lightweight, highly immune to damage, and as permanent as glass itself. It will not rot, corrode, mildew or otherwise deteriorate. And its all-glass-fiber construction makes it ideal for chilled and heated piping from sub-zero to 350° F. temperatures. G-B Snap*On is manufactured in thicknesses from ½" to 3" and is available in 3' lengths, plain or with a wide variety of facings and in 6' lengths, unfaced.

APPLICATION SPECIFICATIONS

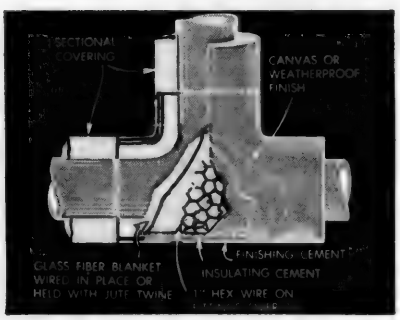


INSULATION OF PLUMBING AND HEATED PIPE FITTINGS ON PIPE SIZES UNDER 4" — INSULATING CEMENT Fittings on pipe sizes under 4" shall be insulated with insulating cement to the same thickness as the covering on the adjacent piping. In all cases, the cement shall be applied in two layers; the first layer allowed to dry before succeeding layer is applied. Final coat of cement shall be troweled to a smooth surface.

INSULATION OF PLUMBING AND HEATED PIPE FITTINGS FOR PIPE SIZES 4" AND LARGER—NESTING SIZE SECTIONAL COVERING Fittings on pipe sizes 4" and larger shall be insulated with nesting size sectional covering to the same thickness as the adjacent pipe insulation. The insulation shall be cut to fit in a neat workmanlike manner with all joints butted and held securely in place with copper-clad insulation staples. All joints shall be pointed up with insulating cement prior to receiving surface finish.

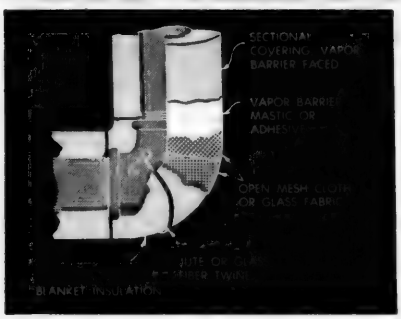


OPTIONAL BLANKET METHOD


SECTIONAL COVERING
CANVAS OR WEATHERPROOF FINISH
GLASS FIBER BLANKET WIRED IN PLACE OR HELD WITH JUTE TWINE
FINISHING CEMENT
INSULATING CEMENT
1" HEX WIRE ON

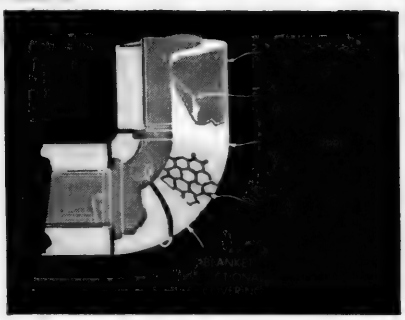
INSULATION OF PLUMBING AND HEATED PIPE FITTINGS ON PIPE SIZES 4" AND LARGER

The fittings on pipe sizes 4" and larger shall be insulated by firmly wrapping with a long textile-type glass fiber blanket insulation, held in place by wrapping with jute twine, to a thickness ½" less than the thickness of the adjacent pipe insulation. On pipe sizes larger than 6", a 1" galvanized hex mesh shall be wired in place over the insulation prior to receiving 2 coats of insulating cement.


SECTIONAL COVERING, VAPOR BARRIER FACED
VAPOR BARRIER MASTIC OR ADHESIVE
OPEN-MESH CLOTH OR GLASS FABRIC
JUTE OR GLASS FIBER TWINE
BLANKET INSULATION

INSULATION OF COLD AND DUAL TEMPERATURE PIPE FITTINGS—CONCEALED PIPING

All cold piping valves, flanges and fittings shall be insulated with a long textile-type glass fiber blanket insulation wrapped firmly under compression (minimum 2 to 1) to the thickness of the adjoining pipe insulation and held in place by spiral windings of jute twine. A subsequent wrapping of open-mesh cloth or glass fabric tape shall be wrapped over the blanket insulation, overlapping the adjoining pipe insulation, and heavily coated with vapor barrier mastic.



WEATHERPROOFING — OUTDOOR PIPE FITTING INSULATION

All insulated fittings exposed to the weather shall be weatherproofed with two layers of asphalt mastic troweled to a smooth even finish. Fittings over 4" pipe size shall have a reinforcing membrane of open-mesh glass fabric or 1" galvanized hex wire applied after the first layer of mastic is applied. The second layer shall be applied after the first is dry. Mastic and reinforcing membrane shall overlap the weatherproof jacket of the adjacent pipe covering at least 3".

†A complete series of G-B Snap*On specifications has appeared in this publication in the past months. If you missed any of them and would like to have a complete set of G-B Snap*On specifications, simply write:

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222 W. 10th St., Kansas City, Mo.

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Thermal and acoustical glass fiber insulations . . . Molded glass fiber pipe insulation . . . Couplings and fittings for plain and grooved end pipe

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The type CSI NASH Heating Pump sets a new standard of economy

Now a Nash quality Vacuum Heating Pump can be economically installed and operated on any steam heating job. Engineered for high performance and low installed first cost, this new pump still makes use of time tested Nash principles of operation.

The Nash CSI has generous air capacity and features a wide choice of water capacities and discharge pressures. The right combination of capacities is at hand to match the requirements of the job. It is no longer necessary to pay extra for a pump with excessive water capacity, excessive discharge pressure, or in an attempt to get adequate air capacity.

With this advanced design, Architects, Engineers and Contractors will find answers to many heating system problems. Send for bulletin now.

1 ECONOMY IN FIRST COST

2 ECONOMY OF INSTALLATION

3 ECONOMY OF OPERATION

4 ECONOMY OF MAINTENANCE

NASH ENGINEERING COMPANY
449 WILSON, SO. NORWALK, CONN.

Just as this shopping center now does, will the building of the future employ

GAS TURBINES to Provide Electricity, Heat and Air Conditioning?

I. E. ROWE
Director of Utilization, United Gas Corporation
Shreveport, La.

The gas turbine has established a place for itself in central station generators, gas pipe line compressors and certain refinery and blast furnace applications. Even greater opportunities for the gas turbine lie ahead, the author believes, in generating power within the building and recovering waste heat for steam-operated absorption refrigeration units.

DURING THE PAST DECADE gas turbines have established a record of reliability and economical performance in hundreds of applications such as electric power generation, pumping oil, and compressing gas in pipe line operations. The gas turbine also fits significantly into the future of large tonnage air conditioning installations.

Lighting and the Heating Load

Several gas utilities have had recent experiences with new building designs which utilize few or no windows and high intensity lighting systems. Since there is little heat loss from a windowless building, a good lighting system can easily furnish enough heat to maintain standard comfort design conditions. The lighting may even furnish enough heat for hot water requirements by using a conventional heat pump arrangement.

When a building uses enough electricity for its lighting to heat during the winter, the power requirements to remove the heat by refrigeration in the summer are quite high. However, if this building could generate its own power for a reasonable cost and recover enough heat for auxiliary heating and refrigeration requirements, substantial savings would result.

This objective can be attained through power generation with gas turbines which recover waste heat for low pressure steam operated absorption refrigeration units.

One such installation has already been made in a large shopping center. Shown in the photo above while still under construction, the Park Plaza Shopping Center, in Little Rock, Ark., employs a gas-powered turbine which generates 900 kilowatts of 480-volt, 60-cycle electricity. The high-temperature exhaust gas from the turbine is fed to a waste heat boiler, where steam is produced for heating and air conditioning any day of the year.

The principal uses for gas turbines in commercial and industrial buildings will be for driving (a) electric power generators and (b) refrigeration compressors (See Fig. 1). With either application, waste heat can be recovered for (1) heating water, (2) making steam for process uses, (3) heating the build-

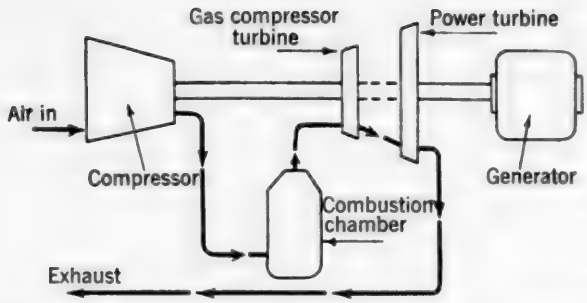

Fig. 1. This schematic arrangement shows a gas turbine driving an electric generator. Such turbines can also be prime movers for refrigeration compressors.

ing, and (4) operating absorption refrigeration equipment for air conditioning. Thus, a typical configuration evolves for these installations wherein the turbine exhausts into an efficient waste-heat boiler and, in the same assembly, space is provided for a power generator or centrifugal compressor (See Fig. 2 and 3).

Until compressors and generators can be obtained which will operate satisfactorily at turbine rotative speeds (25,000 to 50,000 rpm), it will be necessary to use speed reducers with commercially available equipment operating at 1800 to 6000 rpm.

Design Recommendations

The turbine with its accessories should be housed in an acoustically treated enclosure to keep equipment room noise levels below the NC-70 spectrum. The starting and operating controls should be accessible and visible from the outside of the enclosure. The ventilation system for the turbine compartment should be self-contained. An air intake silencer may be a part of the assembly or it may be furnished as a separate accessory. Means should be provided for bypassing the exhaust gases around the waste heat boiler. When the bypassed exhaust gases are discharged directly to the outside, proper consideration should be given to the attenuation of noise at this point.

In commercial and industrial buildings the gas turbine driven generator may be used to furnish power for electric motors and lighting or for lighting only. The turbine may also drive a compressor for air conditioning or other refrigeration applications such as cold storage and industrial processes. The air conditioning refrigeration compressor may also be used during the winter on the reverse cycle as a heat pump (See Fig. 4). These heat pump installations may be the air source type, but water will very likely be used as a heat source for the larger installations. Most refrigeration systems above 50 tons capacity are water cooled, thus circulating water would be available for oil coolers, except possibly at temperatures below freezing.

Some industrial plants use large quantities of compressed air for various purposes. These compressors could very well be driven by gas turbines.

Single Shaft vs. Double Shaft Design

No pattern is apparent for single versus double shaft design. More efficient handling of variable loads and speeds and less power for starting favor the double shaft type. Satisfactory performance on many applications and lower first cost make the single shaft unit the logical choice for such a large number of installations that these reasons cannot be ignored. Other factors weigh heavily in the decision to use either the single or double shaft turbine. A complete analysis of the load characteristics by hours throughout the year is necessary. This load analysis should be related to corresponding outside air temperatures because the compressor capacity and turbine efficiency are affected by the temperature of the inlet air. The use of an open or regenerative cycle turbine also influences the decision to use single or double shaft design.

Double shaft turbines usually have two more bearings than the single shaft models. With either type, the turbine and compressor wheels and bearings should be designed for 100,000 hours of equivalent full load life. Combustor liners and miscellaneous operating accessory parts should be designed for a 10,000 to 20,000-hour minimum life. Combustor liners in pipe line compressor turbines are presently giving 30,000 hours of service without replacement.

Starting

Most turbine prime movers above 200-300 hp will probably be started by an attendant, but there may be some larger installations designed for unattended starting. When the turbine is started by an electric motor, there will be many installations which should not require city current for this purpose. Most turbines can be furnished with a standard d.c. motor starter operated from batteries. A small hand started turbine powered air compressor could be used for starting one or more larger gas turbines. A standard small turbine with an oversized compressor might be designed for supplying air under pressure for starting. The starter turbine or main turbine may also be powered with compressed air stored in large vessels suitable for that purpose.

Stand-by Interruptible Rate Fuels

Many gas utilities have rate schedules which pro-

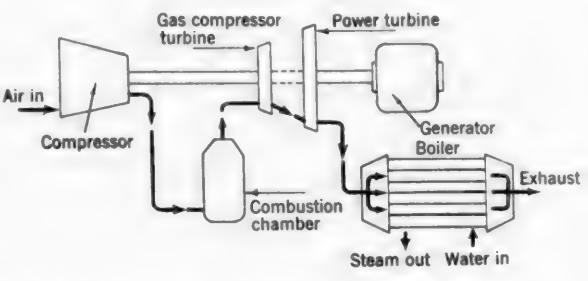

Fig. 2. Schematic diagram shows gas turbine exhausting to a waste heat boiler.

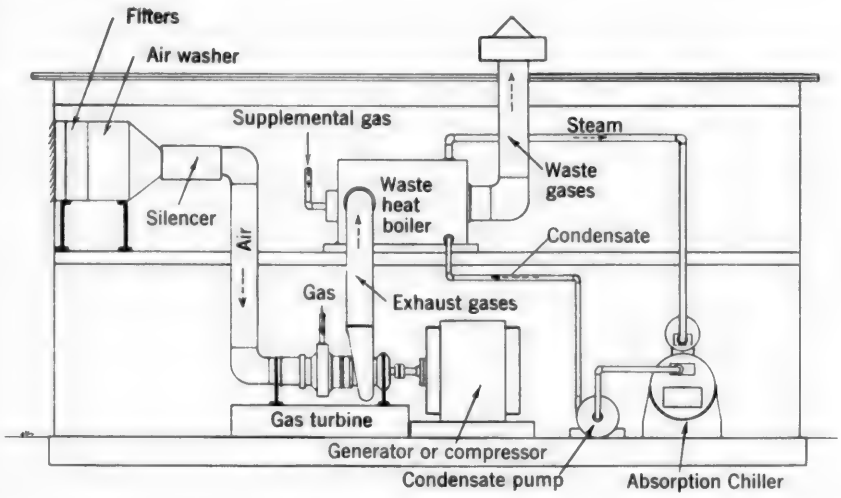

Fig. 3. General arrangement of a gas turbine exhausting to a waste heat boiler which, in turn, powers an absorption chiller.

vide for interruption of service during peak loads. This gas is sold at a rate less than firm or uninterruptible gas. In such instances, a user who must have continuous plant operation often finds that it costs less to provide a standby fuel and take the lower rate. The standby fuel may be one of the LP gases or it may be fuel oil. Utility gas deliveries on interruptible contracts are almost never disturbed except during severely cold weather. Where the owner elects to generate his own power, the utility might give serious consideration to special power generation rates on a firm basis. Packaged turbine power units should be designed to burn natural and LP gases or gas (natural or LP) and oil in the same combustor. It should be possible to make the fuel transfer while running under load.

Gas Compressors

Originally, practically all gas turbines are designed to burn liquid fuels. The conversion to burn gaseous fuels in the same combustor configuration is not difficult. Except for locations on high pressure (above 50 psig) supply loops and feeders, most utility gas is distributed at pressures from 4 inches water column to 30 psig. Many gas powered turbine installations in buildings will thus need gas compressors. These compressors will need to be designed for pressure ratios ranging from 5 to 1 to 10 to 1. It would be very desirable, eventually, to have the gas compressor designed as a separate part of the turbine and air compressor. For larger installations with one or more power turbines, a small gas turbine driven gas compressor might offer more flexibility than could be incorporated into the compressor of the large unit. The exhaust from the small turbine compressor could discharge into the waste heat boiler of the main power unit.

Waste Heat Boilers

A waste heat boiler has previously been mentioned as a desirable accessory for certain commercial and industrial gas turbine installations. This boiler could supply steam or high temperature water for absorption refrigeration units already available in sizes from 25 to 1,000 tons capacity. In the winter the steam could be used for space heating or preheating the outside air supply. Year 'round the steam could be used for large volume cooking, water and solution heating, and miscellaneous applications such as steam cleaning, drying, laundry and pressing machines, and steam turbines.

It is important to note that most of these applications require only low pressure steam (less than 15 psig). This permits a higher recovery of the waste heat than is possible with steam at 100 or 125 psig. Further, code requirements for pressure vessels, piping and accessories, as well as operating personnel, are more favorable for installations operating at steam pressures less than 15 psig than for higher pressure applications.

If such advantages are to be realized, the turbine manufacturers will need to publish steam quantities available from waste heat boilers for various turbine loads and entering air conditions. It should be possible with a well designed counterflow waste heat boiler to produce 15 psig (250 deg. F.) steam with

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I. E. Rowe has been Director of Utilization for United Gas Corporation for the past seven years, and has served in various engineering and operating assignments for an additional fourteen years. A graduate mechanical engineer and registered professional engineer, he is a member of ASHRAE, several A.G.A. research and approval requirements committees, and NFPA Committee on Internal Combustion Engines and Gas Turbines.

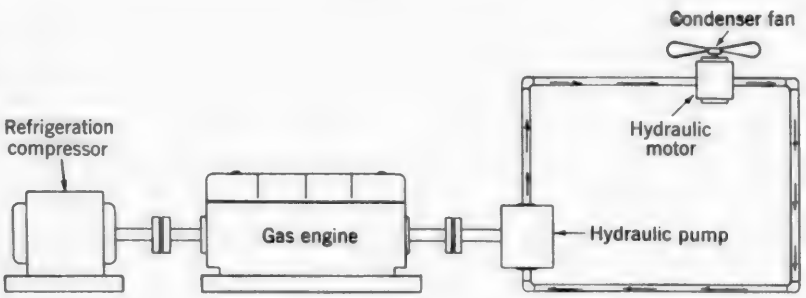


Fig. 4. Gas engine drive for heat pump. Outside air fans are driven by hydraulic motors powered by the engine. Engine can be artificially loaded so that heating capacity is unaffected by reduction in outside temperature; loading will increase waste heat. There is no defrost problem with this unit.

a leaving stack temperature of approximately 350 deg. It can be assumed that the steam requirements for many installations will not match the exact waste heat steam capacity available from the gas turbine. The compressor-absorption combination for producing chilled water will be the only application which is self balancing over even a part of the range of requirements.

Controlling Excess Capacity

When the need for waste heat is less than the quantity being generated, the hot gases can be bypassed around the waste heat boiler with automatically controlled diverting dampers. The waste heat boiler is, however, a very effective noise suppressor. The noise intensity of the exhaust is proportional to the fifth power of the absolute temperature of the exit gases. An alternate plan is for the exhaust steam to be piped to the roof and condensed in an air cooled condenser powered by an electric motor or low pressure steam turbine. One company manufactures a complete assembly which includes a steam separator and a steam turbine driving the fan on an air cooled condenser for automatically condensing the excess steam in a waste heat boiler.

Supplementary Steam Generation

When the turbine exhaust does not produce enough steam, the output of the waste heat boiler may be boosted with an auxiliary gas burner. A burner of special design is required because the pressure at the exhaust gas inlet to the boiler may be as much as 2 inches of water. The burner need not be a 100% premix type because the exhaust effluent from a gas turbine contains 80 to 85% of the oxygen content of normal sea level air, and it can be used to support combustion without any complications. The most efficient auxiliary burner in an installation such as this would use the least quantity of premix air from the outside. It may be more economical in some instances to use a separate gas-fired boiler for supplementary steam requirements.

Consideration may be given to overfiring the turbine for infrequent periods if such operation results in an increase of total usable capacity as with the compressor-absorption combination. When the turbine drives an electric generator, any unused capacity of the generator could be used for heating the air between the compressor and combustor of the turbine or the heat may be dissipated in the waste heat boiler.

Inlet and Outlet Ducts

The capacity of the gas turbine can be varied considerably by the pressure drop in the inlet and outlet ducts. Since the waste heat boiler is part of the outlet duct, it is important to keep its resistance to air flow as low as possible. Manufacturers of gas turbines and waste heat boilers should determine practical maximum pressure losses for waste heat boilers with turbines that burn gaseous fuels primarily, and fuel oils intermittently. If there is a special kind of fuel oil that is more readily interchangeable with gas fuels, without fouling the heat transfer surfaces, this should be determined in order to obtain optimum design considerations.

Cleaning Inlet Air

Standards need to be established for inlet air cleanliness for long life gas turbine operation. Several types of air cleaning apparatus have been used. Air washers are effective cleaning devices, and they serve an additional useful purpose during the hot months by evaporatively cooling the inlet air. Air washers cannot be used, however, when the outside temperature is below 32 deg unless the air is preheated (from the waste heat boiler) enough to saturate it at some temperature slightly above freezing. In mild climates, where temperatures go below freezing only a few times each year, it may be possible that saturated air at 35 to 40 deg will not excessively penalize turbine performance when compared with relatively dry air at lower temperatures.

Continuous use of the air washer above 32 deg would reduce entering air to its wet bulb temperature and thus offset the losses that may occur by holding the minimum to 35 deg. It is also possible that air below 32 deg could be considered clean enough without need for washing or filtering in areas normally free from dust and other air contaminants. Otherwise, a separate continuous type air filter must be

employed when the air washer cannot be used.

The total resistance through an air washer, continuous filter, and outside air louver is approximately 1 inch of water gage. In addition, proper provision must be made for sound attenuation in the inlet air duct. The air cleaning equipment should be partially effective for this task and additional sound absorbing devices should be elected only after making proper allowance for the benefit derived from the air cleaning apparatus.

When the turbine is used as a part of a refrigeration system, there may be instances where it will be economical to refrigerate the inlet air for additional power during hot weather.

Turbine Driven Electric Generators

Reference has already been made to the possibility of using the gas turbine to drive an electric generator. When generators are direct connected to typical gas turbines, the resulting frequencies are higher than 60 cycles. This should not be particularly disturbing because many uses have been found for frequencies ranging from 400 to 3200 cycles per second. A 400-cycle motor weighs about one-fourth as much as a 60-cycle motor of equal horsepower. For this reason 400-cycle motors have become popular for portable production line tools. Loss of these tools due to theft is also reduced when frequencies other than 60 cycles are used.

Matched high frequency generators can be switched to operate in parallel without need for conventional synchronization if the indicated frequencies are identical before switching.

Frequency Converters

It is possible to generate all current requirements at 3200 cycles, for example, and use static converters to obtain one or several frequencies of lower value. Conversions can be made at about 95% efficiency with new devices now under development. The frequency of the secondary circuit is a function of its own tuning device which requires about 100 watts. This secondary frequency can be kept constant while the primary frequency is varying several percent.

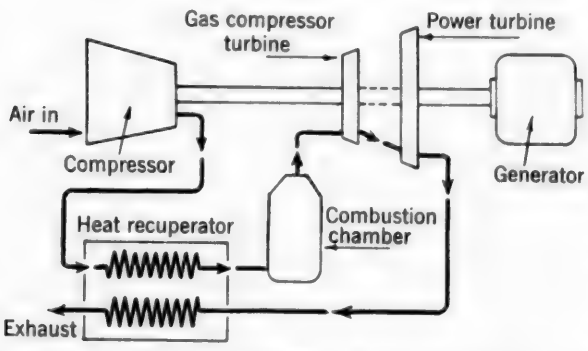


Fig. 5. Under certain conditions it may be desirable to use a regenerative cycle gas turbine exhausting to a waste heat boiler.

High Frequency Lighting

Fluorescent lighting fixtures give more light with the same wattage input when higher frequencies are used. Bulbs may be also loaded up to 140% of their normal wattage rating, and they will still have longer life than on 60 cycles. Thus, the number of fixtures to give the same lighting intensity can be reduced by about one third when allowance is made for high frequency operation. A number of installations have been made using 400 and 840-cycle power distribution. Voltages usually run from 440 to 550 in these systems. This arrangement eliminates the need for the conventional ballast and starter in a fluorescent fixture and at the same time the air conditioning load is reduced because less heat is emitted without the ballast. A simple condenser is used to replace the ballast in high frequency fixtures and its life expectancy is indefinite. A leading power factor results from this combination, but it can be corrected at the generator or remedied with a balanced inductive (motor) load.

One of the best applications for the gas turbine can be developed with high frequency lighting. The principal deterrent to wide application of this new development in lighting has been the high cost of the frequency converting equipment when 60-cycle power is purchased. The frequency and voltage can be tailored to fit the building's needs. It is not necessary to install new lighting fixtures to convert an existing 60-cycle fluorescent lighting system to 400 or 840 cycles. The only major change inside the fixture is the replacement of the ballast with the condenser. In many modern buildings the lighting and the air conditioning loads always coincide.

Thus, when the turbine is used to furnish power for the lighting system with the waste heat utilized for absorption refrigeration, there is no diversity factor.

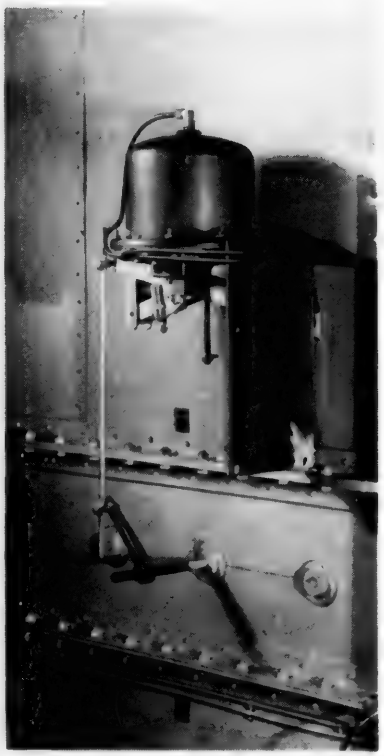
Regenerative Cycle Gas Turbines

Where the demand for waste heat always exceeds that available from a gas turbine, the specific fuel consumption per horsepower is much less important than in instances where there is an over-supply of waste heat. On some installations the steam requirements may vary widely. If the period of over-supply is substantial with an open cycle turbine, it may be desirable to use a regenerative cycle turbine exhausting into a waste heat boiler (See Fig. 5). The increase in cycle efficiency with a regenerator will vary from 25 to 50%. The greatest increase is possible with the low pressure-ratio turbine.

Nothing in the foregoing statement is intended to imply that there is no need for a gas turbine with a regenerative cycle. There will be many applications for efficient prime movers where waste heat recovery is either not important for economic reasons, or it is not needed. However, most industrial and commercial buildings can find some use for waste steam to replace purchased energy. It is in these buildings that the turbine waste heat boiler package will find its widest application.

Controlling WINTER at a

Comet simulator at London airport's Cranebank building is used for BOAC flight training. Two flexible tubes coming out of fuselage bottom carry cool air to mockup interior. Simulator generates 15 kw of heat; a Boeing simulator in another room develops even more of a heat load.



Pneumatic motors operate dampers to regulate intake, exhaust and recirculating air as outside and interior temperatures vary. Even on a cold day cooling is required because of heat from the simulators.

AN air-conditioning system to handle an unusually heavy wintertime cooling load is a feature of London airport's new Cranebank building. The building houses B.O.A.C. training schoolrooms, offices and two flight simulators.

These flight simulators create the cooling problem. Used for pilot training, each is a fuselage section of a passenger aircraft. One is a deHavilland Comet mockup, the other a Boeing.

Electronic equipment for the Comet simulator gives off 15 kw of heat, enough to boost room temperature to over 130 degrees on a cold day. The Boeing simulator's equipment develops even more heat.

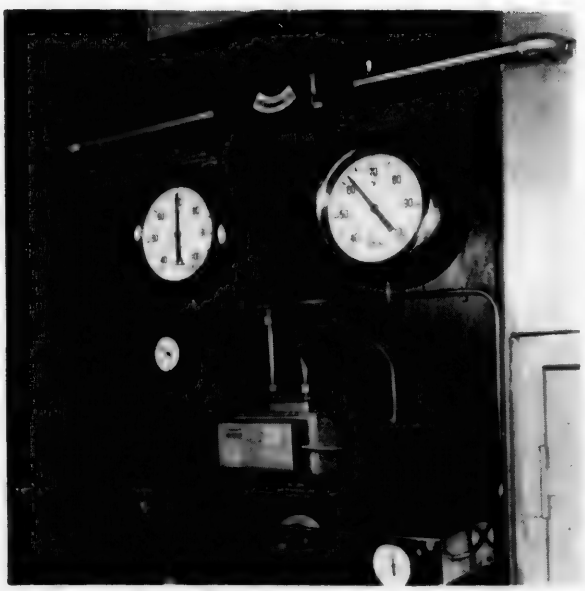
In all, the building has four air-conditioning systems—one for each simulator, one for a Telerama used in training for scenic flight effects and one for the classroom areas. All use the same heating and cooling sources: heat from an oil-fired 1.25-million btu furnace; cooling is furnished by two 45-ton chilled-water units.

Areas containing the simulators and the Telerama are served by a plenum system supplying either warm or cool air. A pneumatic thermostat in the return air duct controls hot- and chilled-water valves and pneumatic dampers on the supply, return and exhaust air ducts. The controls are sequenced so that a rise in room temperature first cuts off the hot-water valve, then opens the fresh-air damper to admit additional outside air, and finally opens the chilled-water valve. As increased cooling is called for, dampers automatically adjust to recirculate the interior air,

COOLING LOADS

Flight Training School

EDWIN SNYDER
Manager, Product Application Engineering
Commercial Division, Minneapolis-Honeywell Regulator Co.
Minneapolis, Minn.

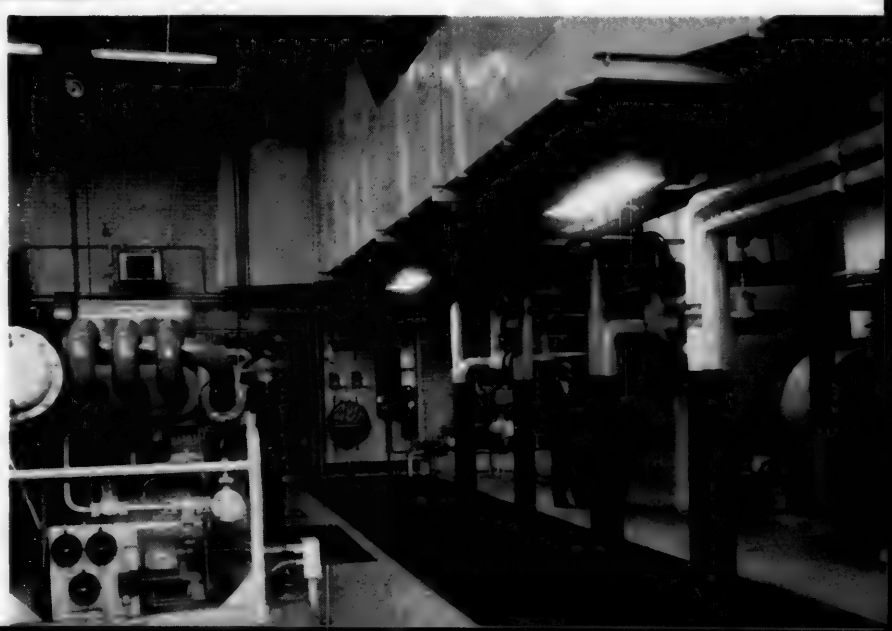


Thermostat for each plenum system is in the plant room, where it measures return-air duct temperature and controls individual air-conditioning system. Pneumatic system uses compressed air required for simulators.

reducing outside-air intake and therefore the cooling load.

Only a pressure-reducing valve is needed for supplying compressed air for the Honeywell pneumatic thermostats and dampers, since a large supply of compressed air is required for the flight simulators.

The school area is handled by a high-velocity dual duct system with conditioned air supplied to the rooms, then returned through an interior corridor to ductwork back to the plant room. The pneumatic system operates valves and dampers as in the plenum systems supplying the other areas.



Four air-conditioning systems are served by the plant room. Three plenum systems are used for the two simulators and the Telerama; the fourth system handles the BOAC flight training school classroom area.

ESTIMATING

Five Basic Forms

Part 2 in this factual series on estimating covers effective office forms to be used by the estimator in assembling and recording his working data.

ROBERT J. SMITH
Mechanical Estimator, Voorhees, Walker, Smith, Smith and Haynes Architects, New York, N. Y.

WHILE SUITABLE TOOLS are important to an artisan working in the field or shop, the estimator depends greatly on intelligently planned office forms or records. Effective forms guide the estimator in the proper assembly of data and they establish order with figures where confusion can otherwise develop.

What should the estimator do after he receives a set of plans and specifications for a new project? He should use a work or computation form as illustrated in Fig. 1. Essentially this form is a sheet of cross section paper, 8½ x 11 inches. On this can be ruled columns for the various pipe sizes, and entries made for pipe specialties and fittings. This sheet lists information regarding the project, name of system and job number. The entries indicate the feet of pipe and number of fittings in the various size groupings that will be required. It shows the types of pipe and their classifications, the variety of fittings, valves, specialties, insulation and hangers. It gives manufacturers' figure numbers applying to these items.

This form, once prepared, is a time saver. On a few sheets the estimator will have the information he needs and he will avoid frequent reference to specifications. Besides, the information will be readily available in an orderly fashion.

It may be necessary to make a sketch of some particular detail, and this is simplified by the cross section paper. The boxes will make it possible to prepare this sketch according to scale.

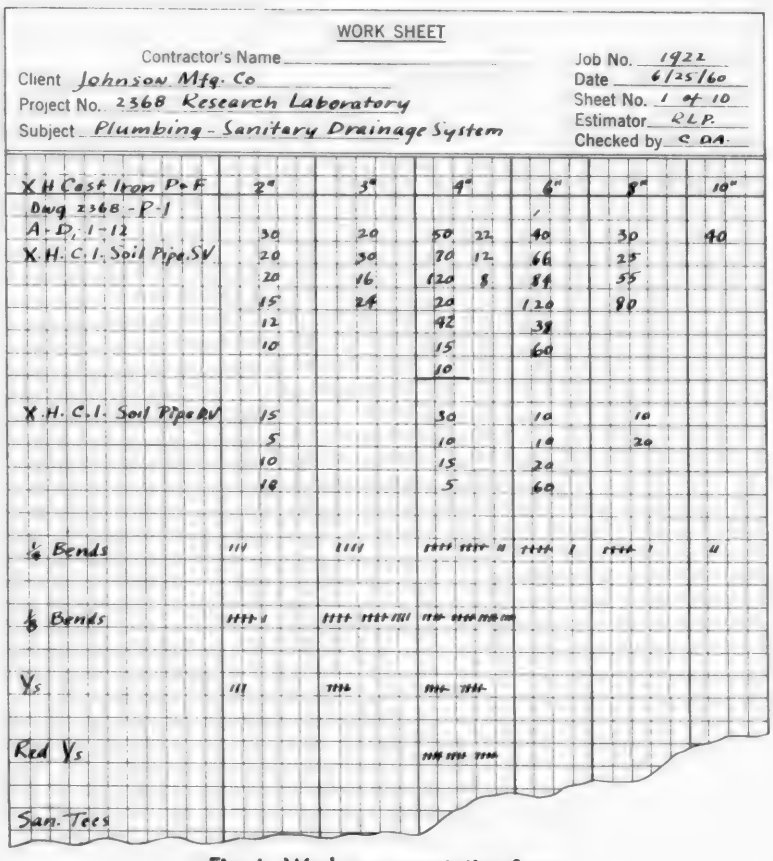


Fig. 1. Work or computation form.

ESTIMATE SHEET
Project No. 6056
Date 6-25-60
Estimator R.L.B.

Plumbing Company
Address
Client JOHNSON MFG. COMPANY
Item Sanitary Soil Waste & Vents

Page ___ of ___
Project - FACTORY & OFFICE BLDG. NEW CITY, NEW YORK
Type Estimate - Preliminary

	Description	Quantity Total	Quantity Unit	Material Rate	Material Cost	Labor Rate	Labor Cost	Total Cost	
	6" x H.C.I Pipe	250	L.F	$3.50	$875.00	$2.10	$525.00	$1400	00

Fig. 2. Estimate sheet — material and labor on a linear foot basis.

This work sheet is valuable when the estimator is ready to make his quantity take-off. It is possible that he will make his take-off by systems such as Sanitary Soil Wastes and Vents, Storm Drains, or Water Lines. Separate sheets can be set up for these systems and material grouped according to size.

The estimator must develop the practice of setting up his take-off sheets in orderly fashion. A direct result is time saved in his work and the elimination of confusion.

As a systematic practice, the system should first be identified and then the area noted in which the take-off is being made. As an example, this would mean the drawing number and the coordinate areas. On these sheets, the estimator should first cover the pipe and then, in order, fittings, valves, specialties, hangers, equipment and insulation. This procedure will place the estimator in a better position to answer quickly and correctly, any questions regarding the estimate. The estimator whose work sheets are vague or disorderly is in for a difficult time should questions arise regarding some data. There are so many things to be considered when preparing an estimate that one must set up the facts as clearly and as organized as possible and not rely on one's memory.

The form shown in Fig. 1 helps the estimator to quickly arrive at the quantities for entering on the estimate sheet, Fig. 2. This form has been designed to show the complete details of the estimate, covering such important items as material and labor on a

ESTIMATE SHEET
Project No.
Date
Estimator

ITEM Sanitary Soil Waste & Vents

Page ___ of ___
Project -
Type Estimate -

	Description	Quantity Total	Quantity Unit	Material Unit	Material Total	Labor MH/Unit	Labor MH/Total	Total Cost	
	6" x H.C.I. Soil Pipe	250	L.F	$2.00	$500.00	.06	15.00		
	4" " " " " "	375	"	1.67	626.75	.04	15.00		
	6" " " " 1/4 Bends	15	ea.	3.26	48.90	2.30	34.50		
	4" " " " " "	24	"	1.95	42.00	1.70	40.80		
	6" " " " Y	4	"	5.00	20.00	3.30	13.20		
	4" " " " Y	2	"	2.70	5.40	2.50	5.00		
	4" " " " 1/8 Bends	6	"	2.35	13.80	2.30	13.80		
	6" Joints	73	"	—	—	1.00	73.00		
	4" Joints	112	"	—	—	.80	89.60		
	Caulking Lead	886#		.15	132.90	—			
	Oakum	90#		.25	22.50	—			
							289.90		
							x $6.50		
	Direct Cost				$1412.25		$1884.35	$3296	90
								Use $3297	00
	Contractors O/H & P. 20%							659	00
	Total Cost							$3956	00

Fig. 3. Estimate sheet — material and labor on a man-hour basis.

linear foot basis. By changing the headings on this sheet, the entries can show material and labor on a man-hour basis.

Figure 3 is similar to Fig. 2, except that the headings are for man-hour entries.

After the material and labor costs are totalled, then the overheads and profit can be added to these totals to show the total estimated cost of the proposed work.

Figure 4 illustrates how to submit an estimate in summary form. It shows the total direct cost for material and labor, arranged by function, and the overhead and profit items that are added to make up the total cost. This type of estimate is generally used by consulting engineers for interdepartmental use and is seldom submitted to the client.

Another form for intercompany use is that shown in Fig. 5. This form is used by consultants where the design is still in progress and has not been completed. There are times, as mentioned previously, where for any number of reasons, changes may be made in design. Drawing changes become involved, and based on these changes, estimates are prepared to show the cost of the proposed changes. This form refers to the project and the project number, numbers of the drawings involved, and the dates of the prints. The cost of the necessary work is shown in total only and there is space on the form for entering any pertinent remarks.

While there are any number of forms that can be used by the estimator, the ones illustrated are considered basic although they may be altered to suit the individual needs of the estimator. The chief argument for the use of these forms is that all materials will be listed and that the information will be presented in a logical manner. With this information listed, it is possible for the estimator to make a visual check as to the adequacy of the items listed—whether the amount of some item might be rather light for the lineal feet of pipe used. By referring to a drawing, a check can be made to see if some item called for on the drawing is listed in the form.

The next article in this series will contain tables of specific estimating data, in terms of minutes and man-hours of labor.

Name PLUMBING COMPANY Page ___ of ___

Address ___
CITY OR TOWN

Subject SUMMARY Telephone No. ___ Project FACTORY & OFFICE BLDG.

Project No. 6058

Date ___ Type Estimate PRELIMINARY

Estimator Client JOHNSON MFG. CO

Item	Description	Material	Labor	Total
1	Storm Sewers	$	$	$
2	Sanitary Sewers			
3	Leaders & Drains			
4	Sanitary Soil Waste & Vents			
5	Temporary Toilet Facilities			
6	Water Services			
7	Hot, Cold & Circulating Water Lines			
8	Hot Water Storage Tank & Heater			
9	Hot Water Circulating Pumps			
10	Booster Heater & Circulator			
11	Plumbing Fixtures			
12	Soap Dispensing Systems			
13	Medicine Cabinets			
14	Insulation			
15	Painting			
	Total Direct Cost	$	$	$
	Labor Insurance			
	Overhead %			
	Profit %			
	Total Cost	$	$	$

Fig. 4. Summary form, usually for interdepartmental use.

ESTIMATE

Date

Project:

Project No.:

Stage of Work:

Ref. Dwg. Nos. ___ Print Date: ___

Heating, Ventilating, Air Conditioning $ ___

Plumbing $ ___

Remarks.

To: By ___

Fig. 5. Revision record, where design is still in progress.

How Much INSULATION for Pipes and Flat Surfaces?

A practical means for specifying the exact thickness of thermal insulation for maximum economy was developed at the College of Engineering, West Virginia University, in cooperation with and under the sponsorship of Union Carbide Chemicals Company. The procedure is embodied in a Manual on Economic Thickness of Insulation for Flat Surfaces and Pipes.

By referring to charts, an engineer can quickly find the solution to any of billions of possible combinations of variables, including cost of heat energy, cost of insulation, cost of capital at various periods of amortization, and conductivities of insulations at different temperatures.

The Manual will be made available in the near future by the National Insulation Manufacturers Association. Because of the importance to the profession of this work, those portions of the Manual most useful to ACH&V readers are reproduced in this and succeeding issues. To provide our readers with the necessary background information, an introduction to this series has been prepared by

C. A. ARENTS
and
H. M. CATHER

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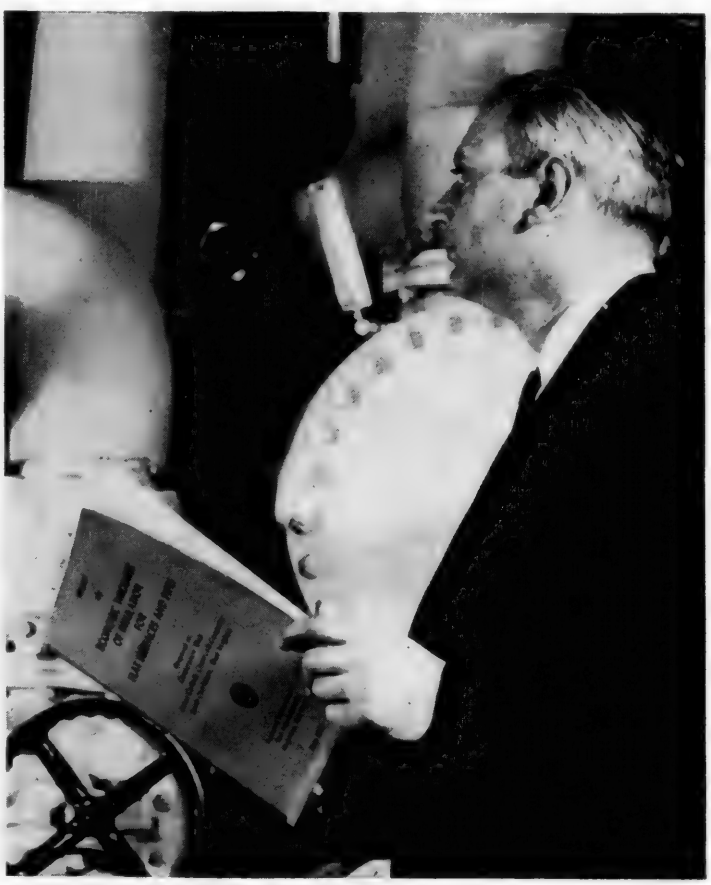
Morgantown



Holding copy of new insulation manual is Joseph Seid, field engineer with Jaros, Baum, and Bolles, as he inspects eleventh-floor mechanical equipment and piping in the new Chase Manhattan Bank building. The copy he holds is from initial printing for use by Union Carbide engineers, for whom the manual was developed.

Chester A. Arents, dean of the College of Engineering, West Virginia University, was born in Kansas, raised in Oregon and considers West Virginia his home. A nationally known consultant to industry on research and development, his professional activities include electrical and mechanical engineering and materials testing. A registered professional engineer in Oregon, Illinois and West Virginia, he is president of the State Board of Professional Engineers in West Virginia. In many parts of the country he is popular as a public speaker.

Harold M. Cather, professor of mechanical engineering, West Virginia University, earned his BSME in 1917 and the degree of Mechanical Engineer in 1939 from Texas A&M. In 1923 he received his MSME from West Virginia. In 1945 became head of its ME department. His specialty is heat power engineering, which includes insulation, heating and ventilating. Practical experience has been obtained through employment in industry and his service, for many years, as technical consultant to the University's Buildings and Grounds Department.

INCREASING COST of fuel, labor, materials, operation and maintenance has prompted many studies to determine methods of reducing costs, improving processes, and increasing production, all of which would result in a more economical operation. Heat losses from hot vessels and pipes were recognized as prime areas for possible improvement. Often, thicker insulation has been specified to decrease heat losses, with no consideration given to the economics of the problem.

In order to use the Manual, certain information and data are essential. Type of insulation must be known or determined by the usual considerations for its selection. Cost of heat, cost of insulation and capital investment values established and accepted by management should be used.

The following data are assumed, to illustrate use of the Manual. They are only for illustration and should not be taken as representative or recommended values.

Operating Data

Nominal pipe size	½ inch
Operating temperature (t_o)	350 F
Ambient temperature (t_{ao})	70 F
Type of insulation	Standard calcium silicate

Cost Data

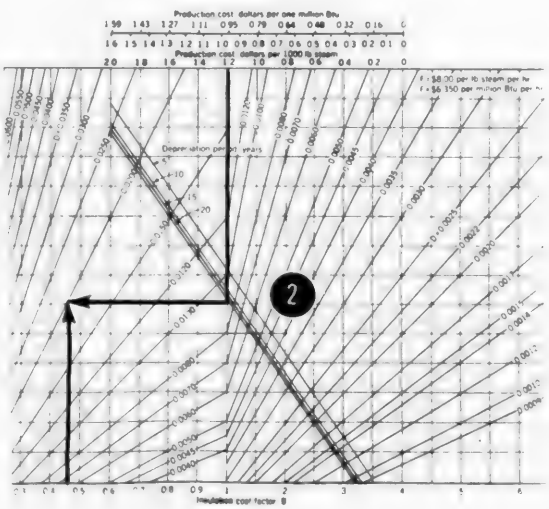
Depreciation period of insulation (N_n)	10 years
Depreciation period of of plant (N_a)	20 years
Plant capital investment (F)	8 \$/(lb steam)(hr)
Total production cost of steam (S')	1.20 \$/1000 lb steam
Installed cost of one inch insulation on a one inch pipe (C)	1.30 \$/(linear ft)(inch)

Only four basic steps are necessary in the use of the Manual for the fast, easy solution of the economic thickness of insulation. The normal rules of interpolation should be observed.

Step 1. Use Table 1, along side the heading $C = 1.30$ (installed cost of 1-inch insulation on a 1-inch pipe) and the 10-year column (N_n) read across to the ½-inch pipe size. At this point, read the insulation cost factor B. *The value of B is 0.453.*

Table 1. Insulation Cost Factor, B

C	N_n	Nominal Pipe Size, Inches ½	¾	1	1¼	1½	2	2½	3
	20			0.366	0.422			0.507	0.523
1.30	5		0.697	0.777	0.895	0.729	1.005	1.203	1.108
	10	0.453	0.473	0.527	0.607	0.494	0.681	0.816	0.751
	15		0.403	0.450	0.518			0.696	0.641



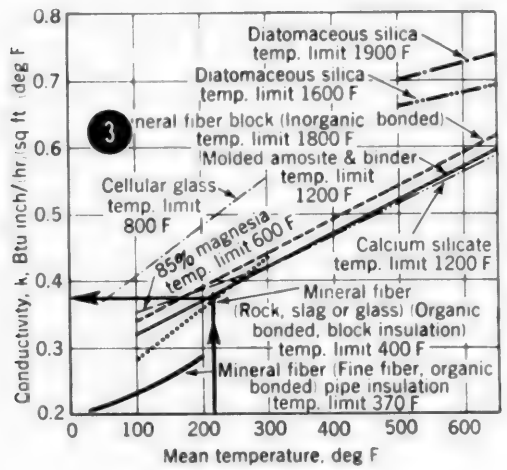
In 1926, L. B. McMillan presented a paper (ASME No. 2034) in New York City on economic thickness of insulation. Because his formulae for calculating economic thickness of insulation were so complex and their solution so tedious and time consuming, they proved to be of little practical value.

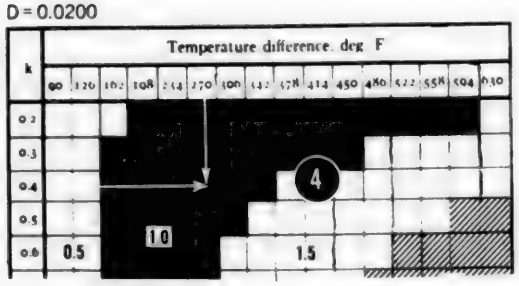
Thickness of insulation was determined by easier methods. In many instances, temperature difference was the basis for selection. Eventually, empirical formulas, graphs, tables, "factors" and simplified methods were published. Very few of these methods determined actual economic thickness because, in order to simplify selection, many factors relating to the economic thickness were disregarded as their inclusion would have complicated, and thus defeated, the purpose of simplicity.

Since World War II, Design and Construction Department, Union Carbide Chemicals Company, division of Union Carbide Corporation, spends many millions of dollars each year for new construction. Between 3 and 6% of its chemical plant construction costs goes for thermal insulation, yet there had been no simple, straight-forward method for its economical design. Applying McMillan's equation in its original form to obtain economic thickness of insulation for hundreds of pipes was definitely not an economical use of skilled personnel.

The Department made several spot checks of existing pipe lines by manual solution of McMillan's equation, after the necessary cost data had been obtained. Results indicated savings up to two dollars per foot of pipe line per year with proper change in

Step 2. Plant capital investment (F) is given as $8.00 per pound of steam per hour. Use Fig. 1-4. Enter the chart at the total production cost of steam (S') = $1.20 per 1000 lb steam and read down until the curve for 20-year depreciation (N_s = 20) is reached; then proceed horizontally to the intersection of the vertical line through the value of B = 0.453, as determined in Step 1. The point of intersection is on the D = 0.0200 curves. *The value of D is 0.0200.*


Conductivity, k, Btu inch/hr sq ft deg F
Mean temperature, deg F
Diatomaceous silica temp. limit 1900 F
Diatomaceous silica temp. limit 1600 F
3
Mineral fiber block (Inorganic bonded) temp. limit 1800 F
Molded amosite & binder temp. limit 1200 F
Cellular glass temp. limit 800 F
85% magnesia temp. limit 600 F
Calcium silicate temp. limit 1200 F
Mineral fiber (Rock, slag or glass) (Organic bonded, block insulation) temp. limit 400 F
Mineral fiber (Fine fiber, organic bonded) pipe insulation temp. limit 370 F



Step 3. Mean temperature, t_m = (operating temp., t_o + ambient temp., t_{am}) ÷ 2.

$$t_m = \frac{350 + 70}{2} = \frac{420}{2} = 210 \text{ deg}$$

Use Fig. 2-1. Enter the chart at the mean temperature of 210 deg; go up to the standard calcium silicate curve and read k factor (conductivity in Btu-inch per (hr) (sq ft) (deg F) on the left axis as 0.38. This value should be adjusted to the nearest tenth. *The value of k is 0.4.*

Step 4. Temperature differential, $\triangle t$ = operating temperature, t_o — ambient temperature, t_{am}.

$$\triangle t = 350 - 70 = 280 \text{ deg.}$$

The economic thickness may now be determined by the use of Table 2. Find the ½ inch pipe section, then locate the portion with a value of D = 0.0200. Enter the table where k = 0.4 as determined in Step 3 and go horizontally to the column with $\triangle$t = 280 deg F. This value is *not* tabulated. Therefore, apply the normal rules of interpolation. Use the column of $\triangle t$ = 270 F and read 1.0. *The economic thickness for the conditions given is 1.0 inch.*

By use of the Manual the economic thickness of insulation for the given data can be determined in a few minutes. The same problem solved by an experienced engineer using the original McMillan formulas would have taken approximately four hours.

Table 1. Insulation Cost Factor, B

C = installed cost of one inch of insulation on one-inch pipe. N_n = depreciation period of insulation, years.

C	N_n	Nominal Pipe Size, Inches																	
		½	¾	1	1¼	1½	2	2½	3	3½	4	5	8	10	12	14	16	18	20	Flat
0.50	5	0.257	0.268	0.299	0.344	0.281	0.387	0.463	0.426	0.440	0.455	0.507	0.565	0.627	0.683	0.689	0.736	0.780	0.845	0.057
	10	0.174	0.182	0.203	0.233	0.191	0.262	0.314	0.289	0.298	0.308	0.344	0.383	0.425	0.463	0.467	0.499	0.529	0.573	0.039
	15	0.148	0.155	0.173	0.199	0.163	0.223	0.268	0.247	0.254	0.263	0.293	0.327	0.363	0.395	0.398	0.426	0.451	0.489	0.033
	20	0.131	0.137	0.153	0.176	0.144	0.197	0.237	0.218	0.224	0.232	0.259	0.289	0.321	0.349	0.351	0.376	0.398	0.432	0.030
0.60	5	0.308	0.322	0.358	0.413	0.337	0.463	0.555	0.512	0.528	0.546	0.609	0.678	0.752	0.819	0.827	0.883	0.936	1.013	0.068
	10	0.209	0.218	0.243	0.280	0.228	0.314	0.376	0.347	0.358	0.370	0.413	0.460	0.510	0.555	0.561	0.599	0.635	0.687	0.046
	15	0.178	0.186	0.207	0.239	0.194	0.268	0.321	0.296	0.305	0.316	0.352	0.392	0.435	0.473	0.479	0.511	0.542	0.586	0.039
	20	0.157	0.164	0.183	0.211	0.171	0.237	0.283	0.261	0.269	0.279	0.311	0.346	0.384	0.418	0.423	0.451	0.479	0.517	0.036
0.70	5	0.359	0.376	0.418	0.482	0.393	0.541	0.648	0.597	0.616	0.637	0.710	0.790	0.877	0.956	0.965	1.031	1.092	1.182	0.079
	10	0.243	0.255	0.283	0.327	0.266	0.367	0.439	0.405	0.418	0.432	0.481	0.536	0.595	0.648	0.654	0.699	0.740	0.801	0.054
	15	0.207	0.218	0.241	0.279	0.227	0.313	0.374	0.345	0.357	0.368	0.410	0.457	0.508	0.553	0.558	0.596	0.631	0.683	0.046
	20	0.183	0.192	0.213	0.246	0.200	0.276	0.330	0.305	0.315	0.325	0.362	0.404	0.449	0.488	0.493	0.526	0.557	0.603	0.042
0.80	5	0.411	0.429	0.478	0.551	0.449	0.618	0.740	0.682	0.704	0.728	0.812	0.903	1.002	1.092	1.102	1.178	1.248	1.351	0.090
	10	0.279	0.291	0.324	0.374	0.304	0.419	0.502	0.462	0.477	0.494	0.551	0.612	0.679	0.740	0.747	0.799	0.846	0.916	0.062
	15	0.238	0.248	0.276	0.319	0.259	0.357	0.428	0.394	0.407	0.421	0.470	0.522	0.579	0.631	0.637	0.682	0.722	0.781	0.052
	20	0.210	0.219	0.244	0.282	0.229	0.315	0.378	0.348	0.359	0.372	0.415	0.461	0.511	0.557	0.562	0.602	0.638	0.690	0.048
0.90	5	0.462	0.483	0.538	0.620	0.505	0.695	0.833	0.767	0.792	0.819	0.913	1.016	1.128	1.229	1.240	1.325	1.404	1.520	0.102
	10	0.313	0.327	0.365	0.420	0.342	0.471	0.565	0.520	0.537	0.555	0.619	0.689	0.765	0.833	0.841	0.898	0.952	1.031	0.069
	15	0.267	0.279	0.311	0.358	0.292	0.402	0.482	0.444	0.458	0.473	0.528	0.588	0.653	0.711	0.717	0.766	0.812	0.879	0.059
	20	0.236	0.246	0.275	0.316	0.258	0.355	0.426	0.392	0.404	0.418	0.466	0.519	0.577	0.628	0.633	0.676	0.717	0.776	0.054
1.00	5	0.513	0.536	0.597	0.688	0.561	0.773	0.925	0.853	0.880	0.910	1.015	1.129	1.253	1.365	1.378	1.472	1.560	1.689	0.113
	10	0.348	0.363	0.405	0.466	0.380	0.524	0.627	0.578	0.597	0.617	0.688	0.765	0.850	0.925	0.934	0.998	1.058	1.145	0.077
	15	0.297	0.310	0.345	0.397	0.324	0.447	0.535	0.493	0.509	0.526	0.587	0.653	0.725	0.789	0.797	0.851	0.902	0.977	0.065
	20	0.262	0.274	0.305	0.351	0.286	0.395	0.472	0.435	0.449	0.464	0.518	0.577	0.640	0.697	0.704	0.751	0.796	0.863	0.060
1.10	5	0.565	0.590	0.657	0.757	0.617	0.850	1.018	0.938	0.968	1.001	1.116	1.242	1.378	1.502	1.516	1.620	1.716	1.858	0.124
	10	0.383	0.400	0.445	0.513	0.418	0.576	0.690	0.636	0.656	0.679	0.757	0.842	0.934	1.018	1.028	1.098	1.163	1.260	0.085
	15	0.327	0.341	0.380	0.438	0.357	0.491	0.589	0.543	0.560	0.579	0.646	0.718	0.797	0.868	0.877	0.937	0.992	1.075	0.072
	20	0.289	0.301	0.336	0.387	0.315	0.434	0.520	0.479	0.494	0.511	0.570	0.634	0.704	0.766	0.774	0.827	0.876	0.949	0.066
1.20	5	0.616	0.644	0.717	0.826	0.673	0.927	1.111	1.023	1.056	1.092	1.217	1.355	1.504	1.639	1.654	1.767	1.872	2.027	0.136
	10	0.418	0.437	0.486	0.560	0.456	0.629	0.753	0.694	0.716	0.740	0.825	0.919	1.020	1.111	1.121	1.198	1.269	1.374	0.092
	15	0.357	0.373	0.415	0.478	0.389	0.537	0.642	0.592	0.611	0.631	0.704	0.784	0.870	0.948	0.956	1.022	1.082	1.172	0.078
	20	0.315	0.329	0.366	0.422	0.343	0.474	0.567	0.523	0.540	0.557	0.622	0.692	0.768	0.837	0.844	0.902	0.955	1.035	0.072
1.30	5	0.668	0.697	0.777	0.895	0.729	1.005	1.203	1.108	1.144	1.183	1.319	1.468	1.629	1.775	1.791	1.914	2.028	2.196	0.147
	10	0.453	0.473	0.527	0.607	0.494	0.681	0.816	0.751	0.776	0.802	0.894	0.995	1.104	1.203	1.214	1.298	1.375	1.489	0.100
	15	0.386	0.403	0.450	0.518	0.421	0.581	0.696	0.641	0.662	0.684	0.763	0.849	0.942	1.026	1.036	1.107	1.173	1.270	0.085
	20	0.341	0.356	0.397	0.457	0.372	0.513	0.615	0.566	0.585	0.604	0.674	0.750	0.832	0.906	0.915	0.977	1.036	1.121	0.078
1.40	5	0.719	0.751	0.836	0.964	0.785	1.082	1.296	1.193	1.232	1.274	1.420	1.581	1.754	1.912	1.929	2.061	2.184	2.365	0.158
	10	0.487	0.509	0.567	0.654	0.532	0.734	0.879	0.809	0.835	0.864	0.963	1.072	1.189	1.296	1.308	1.397	1.481	1.603	0.109
	15	0.415	0.434	0.484	0.558	0.454	0.626	0.750	0.690	0.712	0.737	0.821	0.914	1.014	1.105	1.116	1.192	1.263	1.367	0.091
	20	0.366	0.383	0.427	0.493	0.401	0.553	0.662	0.609	0.629	0.651	0.725	0.807	0.895	0.976	0.985	1.053	1.115	1.207	0.084
1.50	5	0.770	0.805	0.896	1.033	0.841	1.159	1.388	1.279	1.320	1.365	1.522	1.694	1.880	2.048	2.067	2.208	2.340	2.534	0.170
	10	0.522	0.546	0.607	0.700	0.570	0.786	0.941	0.867	0.895	0.925	1.032	1.149	1.275	1.389	1.401	1.497	1.587	1.718	0.116
	15	0.445	0.466	0.518	0.597	0.486	0.670	0.803	0.740	0.763	0.789	0.880	0.980	1.088	1.185	1.195	1.277	1.354	1.465	0.098
	20	0.393	0.411	0.457	0.527	0.429	0.592	0.709	0.653	0.674	0.697	0.777	0.865	0.961	1.046	1.055	1.128	1.196	1.294	0.090

thickness of installed insulation. This clearly indicated that the field of thermal insulation design, selection and application provided a fertile field for improvement and economics. As a result, a sponsored research contract was negotiated with West Virginia University. In addition, Union Carbide Corporation's electronic computer was made available for the study.

Since West Virginia University had set up a research group in thermal insulation to study methods of conserving heat energy, it was in a fortunate position to respond to the company's invitation to cooperate in the research program that led to the Manual on Economic Thickness of Insulation for Flat Surfaces and Pipes.

A feasibility study was made to determine the variables to be considered and the increments of each variable over a wide range. If a curve was prepared for each reasonable set of variable conditions of costs, shape, conductivity of insulation and temperature differences, it would require 53,787,880,000 curves or charts.

The device which broke the impasse was a separation of cost factors from thermal constants. It was

Table 1 (continued). Insulation Cost Factor, B

C = installed cost of one inch of insulation on one-inch pipe. N_a = depreciation period of insulation, years.

C	N_a	Nominal Pipe Size, Inches																		
		½	¾	1	1¼	1½	2	2½	3	3½	4	6	8	10	12	14	16	18	20	Flat
1.60	5	0.821	0.858	0.955	1.101	0.897	1.236	1.481	1.364	1.408	1.456	1.623	1.807	2.005	2.185	2.205	2.356	2.496	2.702	0.181
	10	0.557	0.582	0.647	0.746	0.608	0.838	1.004	0.925	0.955	0.987	1.100	1.225	1.359	1.481	1.495	1.597	1.692	1.832	0.123
	15	0.475	0.496	0.552	0.636	0.519	0.715	0.856	0.789	0.815	0.842	0.938	1.045	1.159	1.263	1.275	1.362	1.443	1.563	0.104
	20	0.419	0.438	0.487	0.562	0.458	0.631	0.756	0.697	0.820	0.743	0.828	0.923	1.023	1.115	1.126	1.203	1.274	1.380	0.096
1.70	5	0.873	0.912	1.015	1.170	0.953	1.313	1.573	1.449	1.496	1.547	1.725	1.920	2.130	2.321	2.343	2.503	2.652	2.871	0.192
	10	0.592	0.618	0.688	0.793	0.646	0.890	1.066	0.982	1.014	1.049	1.170	1.302	1.444	1.574	1.589	1.697	1.798	1.947	0.131
	15	0.505	0.527	0.587	0.676	0.551	0.759	0.909	0.838	0.865	0.895	0.998	1.111	1.232	1.343	1.355	1.448	1.534	1.661	0.111
	20	0.446	0.465	0.518	0.597	0.487	0.670	0.803	0.740	0.764	0.790	0.881	0.981	1.088	1.186	1.196	1.279	1.355	1.467	0.102
1.80	5	0.924	0.965	1.075	1.239	1.009	1.391	1.666	1.534	1.584	1.638	1.826	2.033	2.255	2.458	2.480	2.650	2.808	3.040	0.203
	10	0.626	0.654	0.729	0.840	0.684	0.943	1.130	1.040	1.074	1.111	1.238	1.378	1.529	1.667	1.681	1.797	1.904	2.061	0.139
	15	0.534	0.558	0.622	0.717	0.583	0.804	0.964	0.887	0.916	0.948	1.056	1.175	1.304	1.422	1.434	1.533	1.624	1.758	0.117
	20	0.472	0.493	0.549	0.633	0.515	0.710	0.851	0.783	0.809	0.837	0.932	1.038	1.151	1.256	1.266	1.354	1.434	1.552	0.108
1.90	5	0.975	1.019	1.135	1.308	1.065	1.468	1.758	1.620	1.672	1.729	1.927	2.145	2.381	2.595	2.618	2.797	2.964	3.209	0.215
	10	0.661	0.691	0.770	0.887	0.722	0.995	1.192	1.098	1.134	1.172	1.307	1.454	1.614	1.759	1.775	1.896	2.010	2.176	0.146
	15	0.564	0.589	0.657	0.757	0.616	0.849	1.017	0.937	0.967	1.000	1.115	1.240	1.377	1.500	1.514	1.617	1.715	1.856	0.214
	20	0.498	0.520	0.580	0.668	0.544	0.750	0.898	0.827	0.854	0.883	0.985	1.095	1.216	1.325	1.337	1.428	1.514	1.639	0.114
2.00	5	1.027	1.073	1.194	1.377	1.121	1.545	1.851	1.705	1.760	1.820	2.029	2.258	2.506	2.731	2.756	2.945	3.120	3.378	0.226
	10	0.696	0.727	0.810	0.934	0.760	1.048	1.255	1.156	1.193	1.234	1.376	1.531	1.699	1.852	1.869	1.997	2.115	2.290	0.154
	15	0.594	0.620	0.691	0.797	0.648	0.894	1.071	0.986	1.018	1.053	1.174	1.306	1.449	1.580	1.594	1.703	1.804	1.953	0.130
	20	0.525	0.547	0.610	0.704	0.572	0.789	0.946	0.871	0.899	0.930	1.037	1.153	1.279	1.395	1.408	1.504	1.593	1.724	0.120
2.10	5	1.078	1.127	1.254	1.446	1.177	1.623	1.943	1.790	1.848	1.911	2.131	2.371	2.631	2.867	2.894	3.092	3.276	3.547	0.237
	10	0.731	0.764	0.850	0.980	0.798	1.100	1.317	1.214	1.253	1.296	1.445	1.608	1.784	1.944	1.962	2.096	2.221	2.405	0.162
	15	0.624	0.652	0.725	0.836	0.681	0.938	1.123	1.036	1.069	1.105	1.233	1.372	1.522	1.658	1.674	1.788	1.895	2.051	0.137
	20	0.551	0.576	0.640	0.738	0.601	0.828	0.992	0.915	0.944	0.976	1.089	1.211	1.344	1.464	1.478	1.579	1.673	1.811	0.126
2.20	5	1.129	1.182	1.314	1.514	1.233	1.700	2.036	1.876	1.936	2.002	2.232	2.484	2.757	3.004	3.032	3.239	3.432	3.716	0.249
	10	0.765	0.800	0.891	1.026	0.836	1.153	1.380	1.272	1.313	1.357	1.513	1.684	1.869	2.037	2.056	2.196	2.327	2.519	1.169
	15	0.653	0.682	0.760	0.875	0.713	0.984	1.177	1.085	1.120	1.158	1.291	1.436	1.594	1.738	1.754	1.873	1.985	2.149	0.143
	20	0.577	0.602	0.671	0.773	0.630	0.869	1.039	0.958	0.989	1.023	1.140	1.268	1.408	1.535	1.549	1.654	1.753	1.898	0.132
2.30	5	1.181	1.234	1.374	1.583	1.289	1.777	2.129	1.961	2.024	2.093	2.333	2.597	2.882	3.140	3.170	3.386	3.588	3.885	0.260
	10	0.801	0.837	0.932	1.073	0.874	1.205	1.443	1.330	1.372	1.419	1.582	1.761	1.954	2.129	2.149	2.296	2.433	2.634	0.177
	15	0.683	0.714	0.795	0.915	0.746	1.028	1.231	1.134	1.170	1.210	1.349	1.502	1.667	1.816	1.833	1.958	2.075	2.247	0.150
	20	0.603	0.630	0.702	0.808	0.659	0.908	1.087	1.001	1.033	1.068	1.191	1.326	1.472	1.604	1.619	1.729	1.832	1.984	0.138
2.40	5	1.232	1.287	1.433	1.652	1.345	1.854	2.221	2.046	2.112	2.184	2.435	2.710	3.007	3.277	3.307	3.533	3.744	4.054	0.271
	10	0.835	0.873	0.972	1.120	0.912	1.257	1.506	1.387	1.432	1.481	1.651	1.837	2.039	2.222	2.242	2.395	2.538	2.749	0.185
	15	0.712	0.745	0.829	0.955	0.778	1.072	1.285	1.183	1.221	1.263	1.408	1.567	1.739	1.895	1.912	2.043	2.165	2.345	0.156
	20	0.629	0.658	0.732	0.843	0.687	0.947	1.135	1.045	1.078	1.115	1.243	1.384	1.536	1.673	1.688	1.804	1.912	2.071	0.144
2.50	5	1.283	1.341	1.493	1.721	1.402	1.932	2.314	2.132	2.200	2.275	2.536	2.823	3.133	3.414	3.445	3.681	3.900	4.223	0.283
	10	0.870	0.909	1.012	1.167	0.951	1.310	1.569	1.445	1.492	1.542	1.719	1.914	2.124	2.315	2.336	2.496	2.644	2.863	0.193
	15	0.742	0.775	0.863	0.995	0.811	1.117	1.338	1.233	1.273	1.315	1.466	1.633	1.812	1.975	1.993	2.129	2.255	2.442	0.163
	20	0.655	0.684	0.762	0.879	0.716	0.986	1.181	1.089	1.124	1.161	1.294	1.442	1.600	1.744	1.760	1.880	1.991	2.156	0.150

discovered that all cost factors could be resolved into a single variable which could determine the curves in proper relationship to the thermal equations. This was called the *D* factor. Another observation, the use of which simplified calculations, was the fact that plotted insulation costs fell into a family of straight line curves having a common origin.

This Manual is, of course, oriented toward Union Carbide Technical Personnel. However, the system embodied in it is applicable to any heat-using industry of any type, literally anywhere in the world. The equations have been derived so that the economic insulation thickness can be derived under a wide variety of cost factors. The engineer, in using the Manual, determines economic thickness upon the cost conditions of the client company. Benefits commensurate with those achieved by Union Carbide will be realized.

So, whether it is a petroleum refinery in Houston, an orange juice processing plant in Florida, or a large commercial building with a heavy heating and cooling load, the Manual will serve as a short cut to conservation of investment and operational dollars.

SUMMARY OF RATIONALE AND DERIVATIONS OF CHARTS AND TABLES

The solution of the problem of economic thickness of insulation would be relatively simple if heat energy had a single monetary value. Unfortunately the value of energy can vary over a wide range of values. Energy supplied by electricity may be relatively expensive as compared to other energy sources. Conservation of higher cost energy warrants larger insulation expenditures than does that of lower cost energy; therefore, there is an economic thickness of insulation in connection with each case.

Heat in piping systems and vessels is generally produced by process reactions, from fuel, or both. The heat is transmitted either by the process, by steam, by water or special fluids, by hot gas, by electricity, or other media. Each of these influences the dollar value of the heat energy. Because of the wide variation in the dollar value of heat, *economic insulation thickness should not be calculated on the basis of temperature difference alone.*

Similarly, no single set of costs can be given for the total cost of insulation. Insulation costs vary with the type of insulation used, labor cost, efficiency of labor, conditions at location, depreciation, as well as maintenance.

It is desirable that manual on insulation not be restricted to present cost conditions; consequently, the equations which are the bases of the charts and tables are so derived that economic insulation thickness can be determined under a wide variety of cost conditions.

In its simplest terms, the problem of economic insulation thickness may be described as follows: At very low values of insulation thickness, cost of insulation is low, cost of lost heat energy is high. Greater insulation thickness necessitates greater expenditures for insulation, but cuts heat loss; thus lowering this cost. *At some value of insulation thickness the cost of insulation plus the cost of lost heat will be a minimum. This is the economic insulation thickness.*

The amount of heat loss and its cost is affected by conditions of pipe size, temperature, conductivity of materials, insulation thickness, and shape of the containers.

The various factors included in the equations, together with a brief explanation of each are summarized for both economic thickness of pipe insulation and economic thickness of flat surface insulation, to provide the engineer with a basic knowledge for the intelligent use of the Manual.

1. *Cost of heat lost:* The equation for the cost of heat lost, m_p, is

$$m_p = \frac{\pi k \Delta t r_2}{6\left(r_2 \text{ in } \frac{r_2}{r_1} + R_s k\right)} YM \times 10^{-6} \text{ \$ per (yr) (lin ft)}$$

where k = thermal conductivity, Btu-inch per (hr) (sq ft) (deg F)
Δt = temperature difference, inside surface of pipe insulation and average ambient air temperature,
r = (1) inside and (2) outside radius of insulation, inches,
R_s = outside surface resistance, (deg F) (hr) (sq ft) per Btu,
Y = operating time, hr per yr, and
M = total cost of heat, \$ per million Btu

2. *Cost of insulation:* Cost of insulation becomes greater as the thickness increases. For a given pipe size and insulation thickness, the curve of installed cost of insulation per linear foot versus the outside radius of insulation in inches is a straight line for each nominal pipe size. Calling the slope of this curve tan e, the installed cost per linear foot can be expressed as $C' = r_2 \tan e + E$, a constant. Multiplying C' by θ, a factor that adjusts maintenance, cost of money and depreciation, the value of n_p, cost of insulation, is:

$$n_p = \theta r_2 \tan e + E\theta \text{ \$ per (yr) (lin ft)}$$

3. *Total Cost:* Total cost, y_p is the sum of m_p, cost of lost heat, and n_p, cost of insulation.

$$y_p = m_p + n_p \text{ \$ per (yr) (lin ft)}$$

4. *General Equation for Economic Thickness of Pipe Insulation:* Substitution in the above equation for m_p and n_p, differentiating with respect to r_2, and equating this to zero results in:

$$YM \times 10^{-6} \Delta t k \frac{(r_2 - R_s k)}{\left(r_2 \text{ in } \frac{r_2}{r_1} + R_s k\right)^2} - \frac{6C}{\pi (1.38)} \theta \tan e' = 0$$

where C = installed cost of insulation, \$ per (ft) (inch)

$$\text{Letting } B_p = \frac{6C}{\pi (1.38)} \theta \tan e'$$

where B_p = insulation cost factor for pipes, per (ft pipe) (yr) (inch)

$$\text{and } D_p = \frac{YM \times 10^{-6}}{B_p} \text{ the equation becomes,}$$

$$D_p \Delta t k \frac{(r_2 - R_s k)}{\left(r_2 \text{ in } \frac{r_2}{r_1} + R_s k\right)^2} - 1 = 0$$

where D_p = total cost factor for pipes, (hr) (lin ft) (inch) per million Btu

For convenience, B is tabulated as a function of pipe size, installed cost per linear foot per inch thickness, and depreciation period in Table 1.

D is a function of cost of steam, capital investment, interest, depreciation period, and B. Values of D may be determined from the Capital Investment charts that follow. Representative k values are also given. For a given pipe size and known values of D, Δt and k, the value of r_2 which satisfies the last equation above is the outside radius of the economic insulation. The economic thickness is $(r_2 - r_1)$, and this is the quantity tabulated for various pipe sizes and a wide range of values of D, Δt, and k in Table 2.

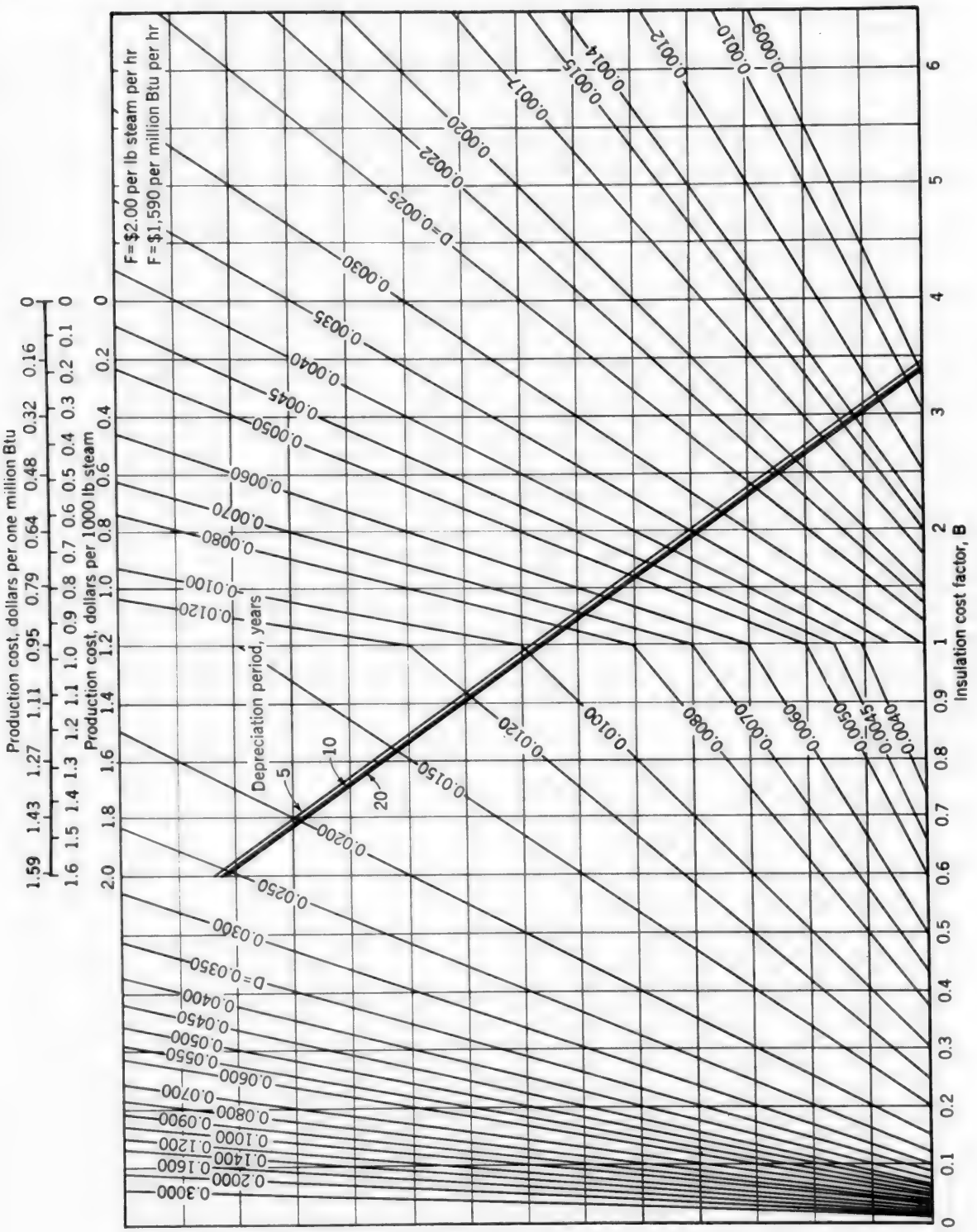

F=$2.00 per lb steam per hr
F=$1,590 per million Btu per hr
Production cost, dollars per one million Btu
Production cost, dollars per 1000 lb steam
Depreciation period, years
Insulation cost factor, B
D=0.0025
D=0.0350

Fig. 1-1. Capital Investment Chart, F = $2.

Enter at top of chart at suitable production cost, S', either in dollars per million Btu or dollars per 1000 lb steam, proceed down to appropriate depreciation-period line, then left or right to **B** value from Table 1. Find **D** value (radial line) nearest, for use in Table 2.

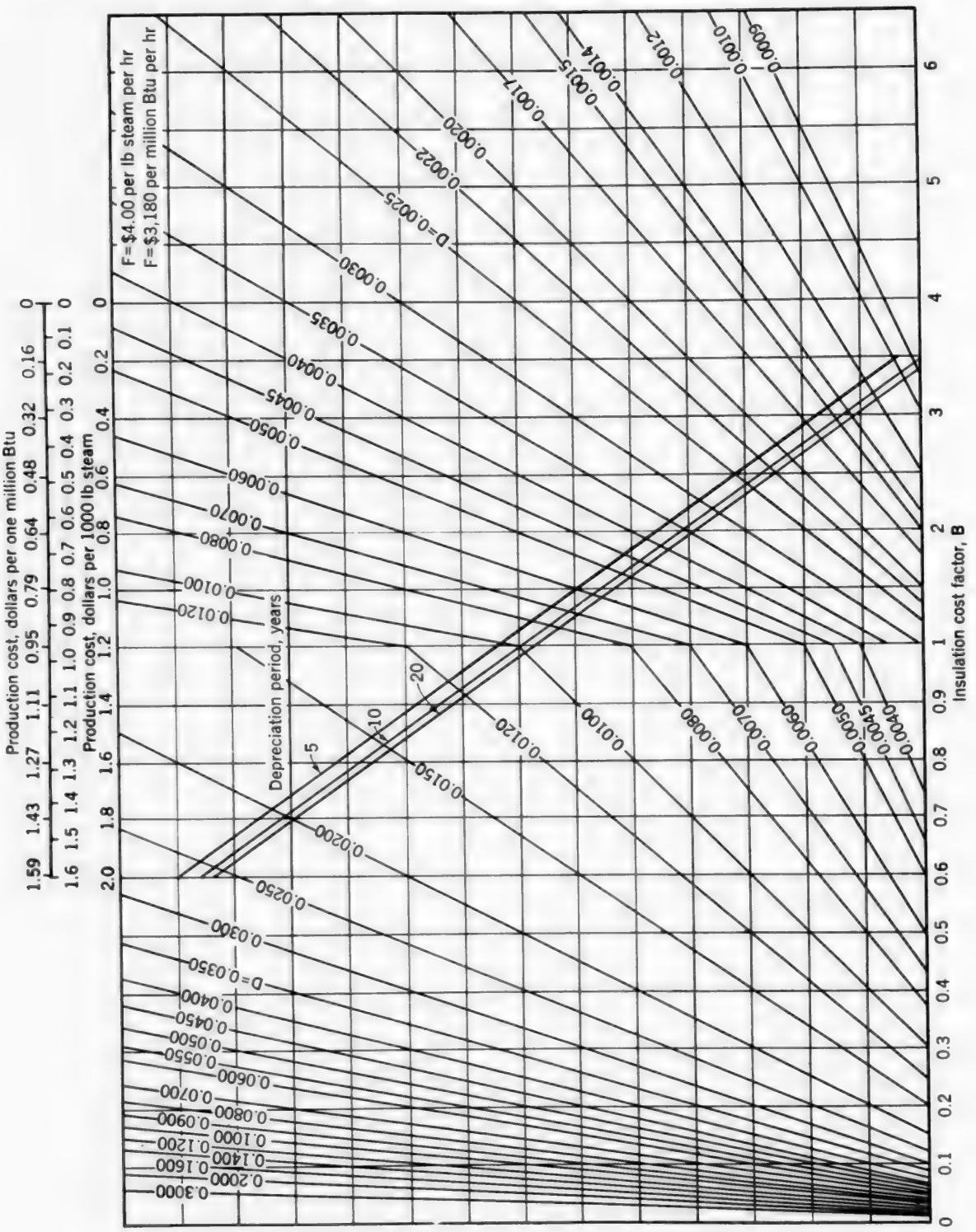


Fig. 1-2. Capital Investment Chart, F = $4.

Enter at top of chart at suitable production cost, S', either in dollars per million Btu or dollars per 1000 lb steam, proceed down to appropriate depreciation-period line, then left or right to **B** value from Table 1. Find **D** value (radial line) nearest, for use in Table 2.

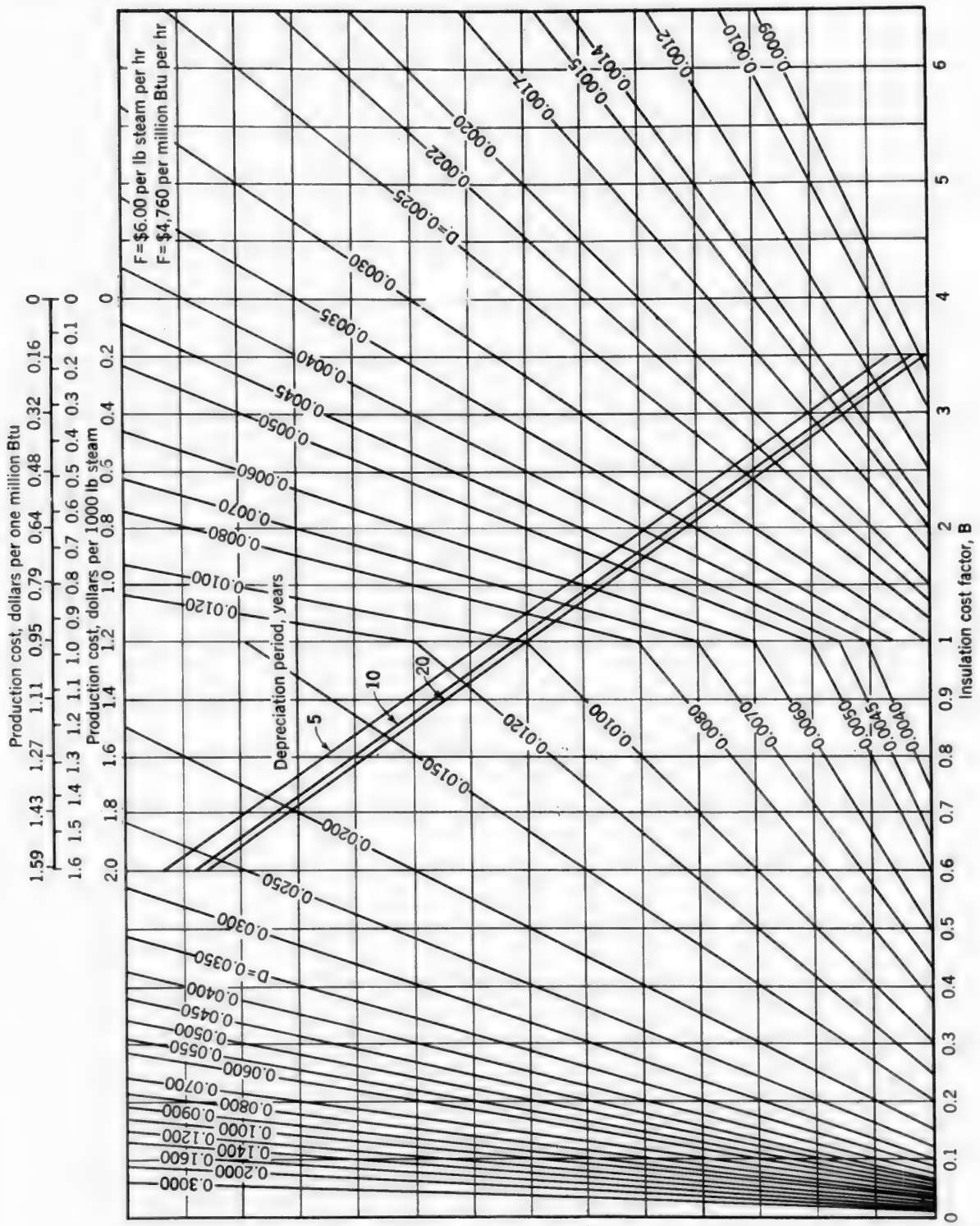


Fig. 1-3. Capital Investment Chart, F = $6.

Enter at top of chart at suitable production cost, **S'**, either in dollars per million Btu or dollars per 1000 lb steam, proceed down to appropriate depreciation-period line, then left or right to **B** value from Table 1. Find **D** value (radial line) nearest, for use in Table 2.

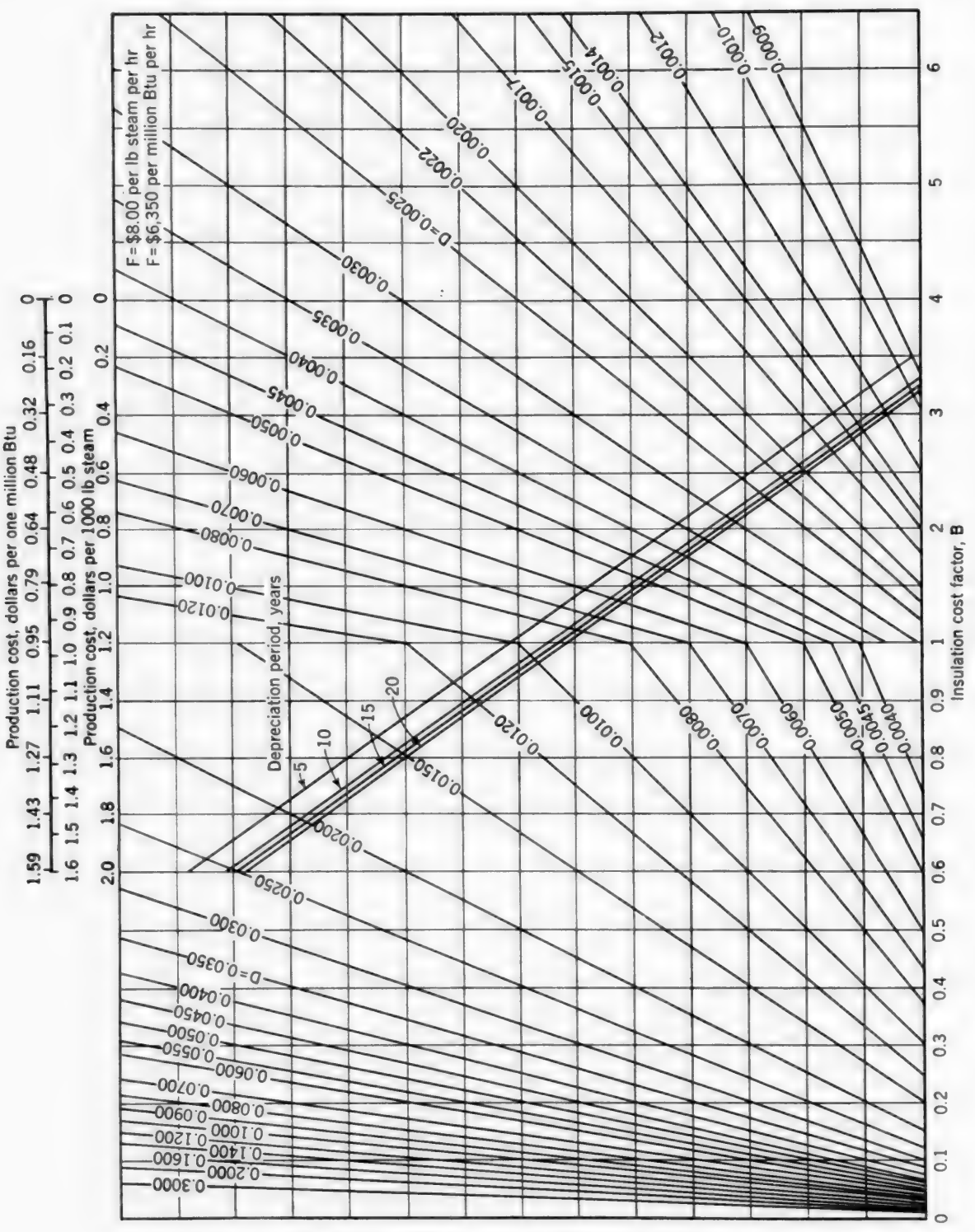


Fig. 1-4. Capital Investment Chart, F = $8.

Enter at top of chart at suitable production cost, S', either in dollars per million Btu or dollars per 1000 lb steam, proceed down to appropriate depreciation-period line, then left or right to B value from Table 1. Find D value (radial line) nearest, for use in Table 2.

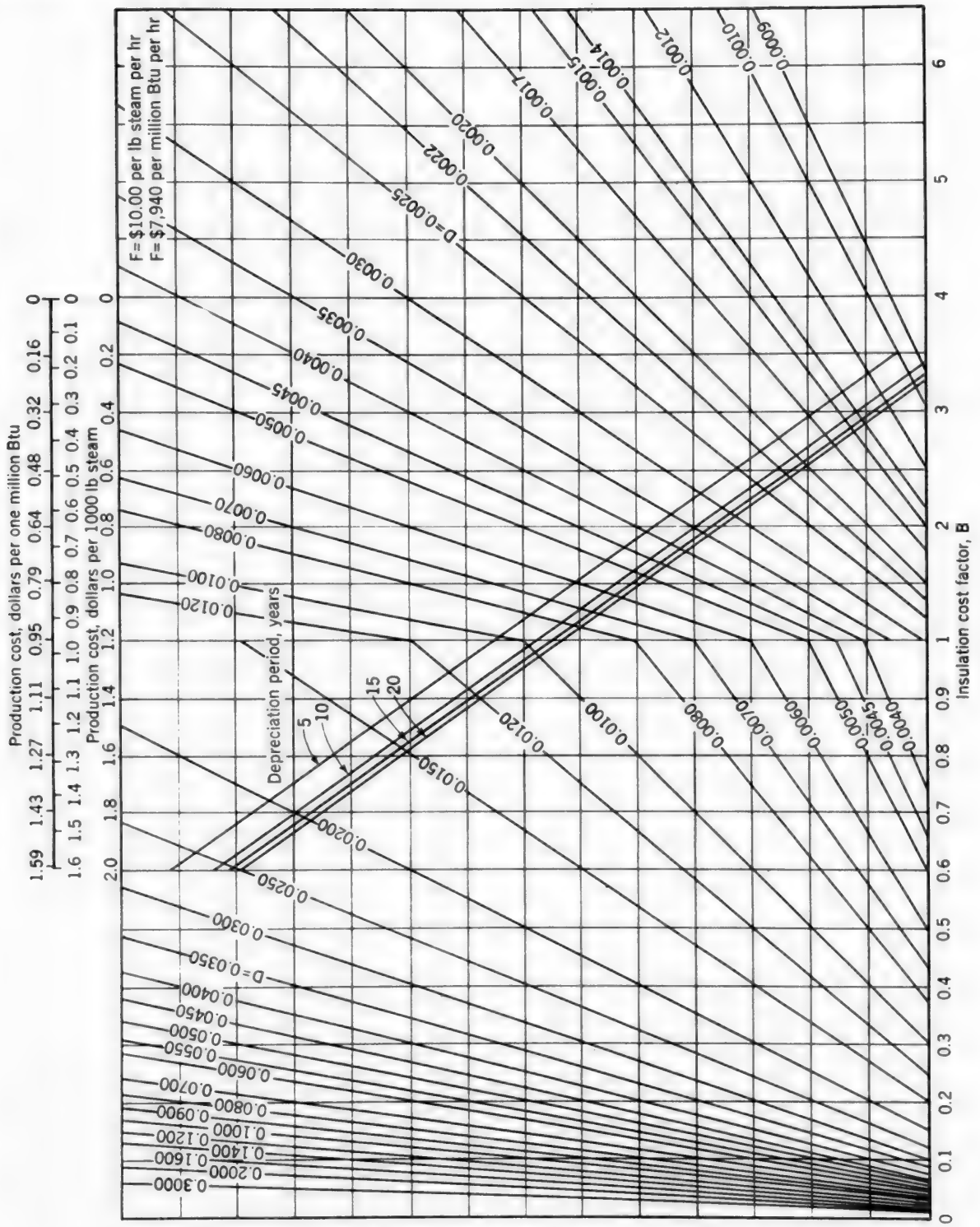

F = $10.00 per lb steam per hr
F = $7,940 per million Btu per hr
Production cost, dollars per one million Btu
Production cost, dollars per 1000 lb steam
Depreciation period, years
Insulation cost factor, B
D=0.0025
D=0.0350

Fig. 1-5. Capital Investment Chart, F = $10.

Enter at top of chart at suitable production cost, S', either in dollars per million Btu or dollars per 1000 lb steam, proceed down to appropriate depreciation-period line, then left or right to B value from Table 1. Find D value (radial line) nearest, for use in Table 2.

Figure 2. Conductivities

(Values are typical. For specific insulation, consult insulation manufacturer.)

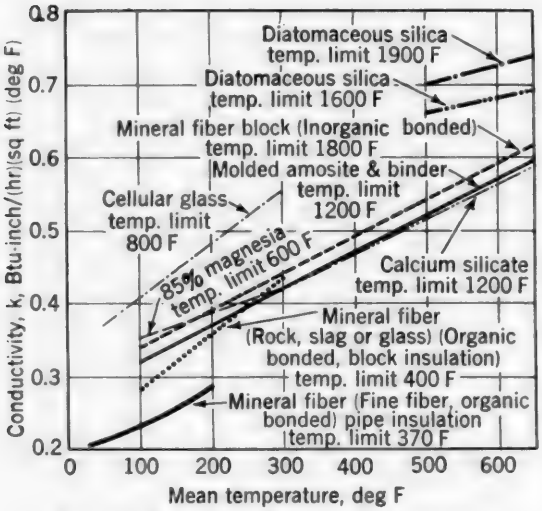


Fig. 2-1. Blocks, board, and pipe insulation.

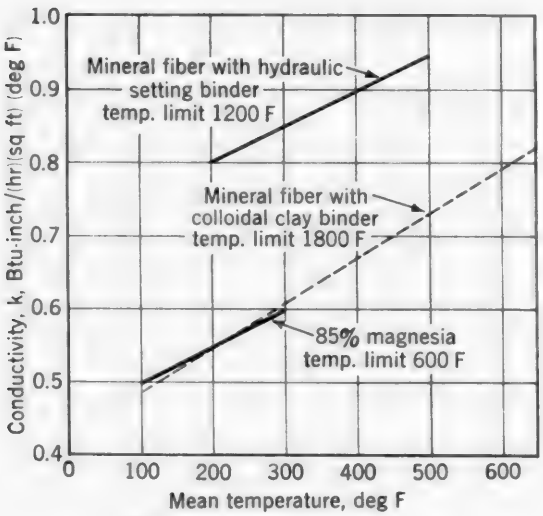


Fig. 2-2. Insulating cements.

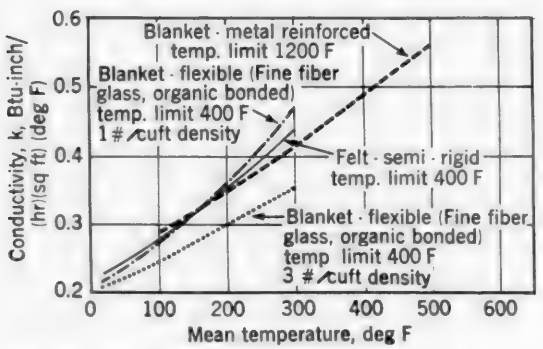
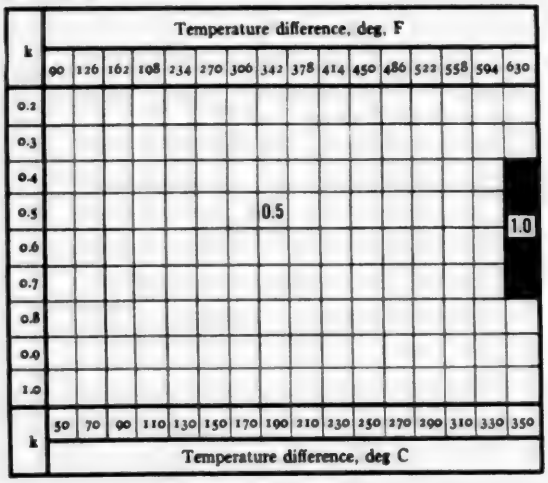


Fig. 2-3. Mineral fiber insulations (rock, slag or glass).

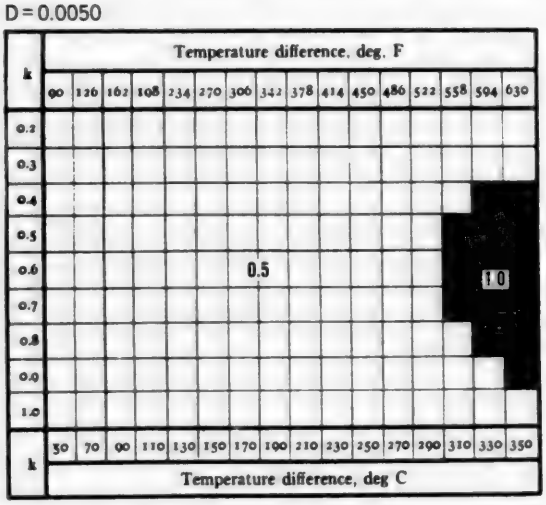
Table 2. Economic Thickness. ½" Pipe

(D from Fig 1; k from Fig. 2; read thickness in inches.)

D = 0.0045



D = 0.0050



D = 0.0060

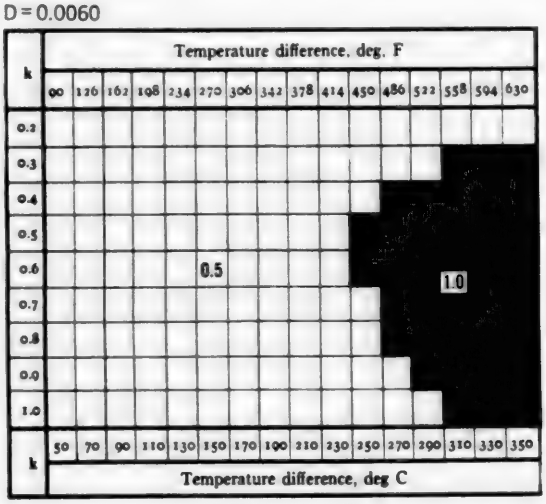
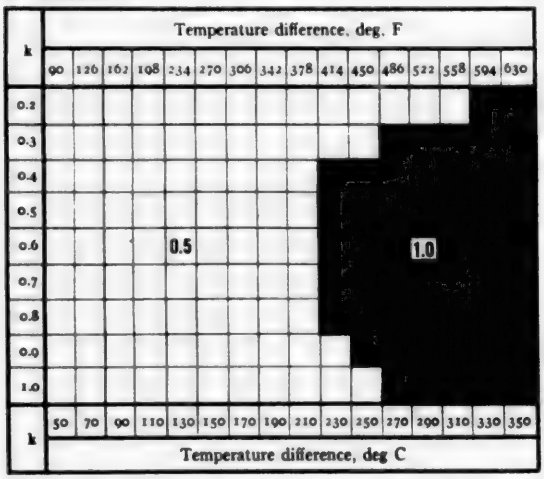
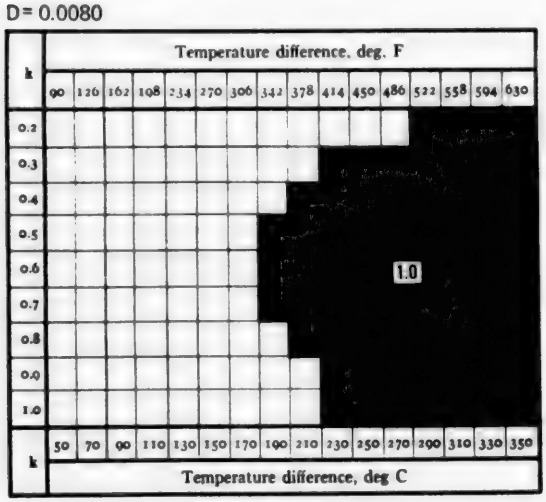


Table 2. Economic Thickness. ½" Pipe
(D from Fig 1; k from Fig. 2; read thickness in inches.)

D= 0.0070



D= 0.0080



D= 0.0100

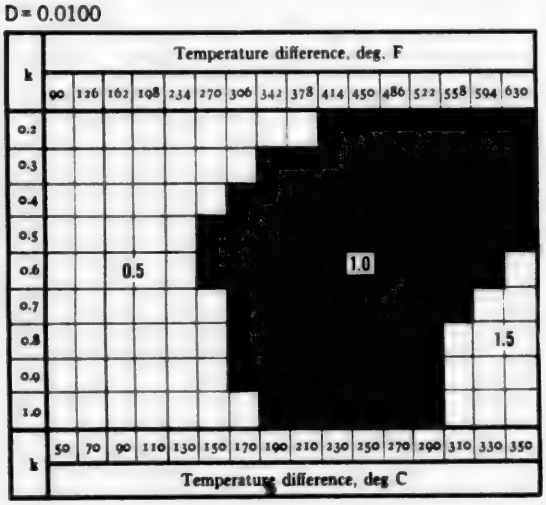
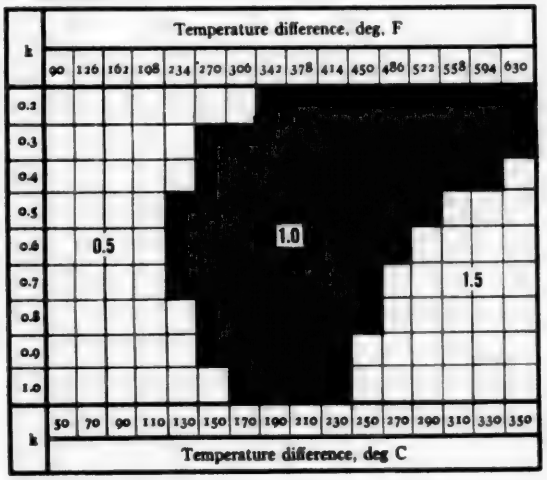
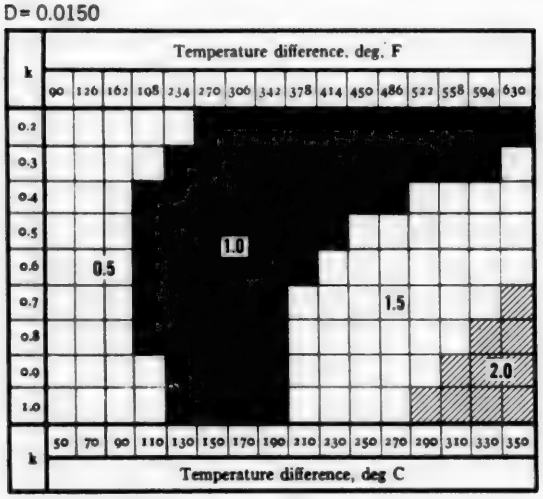


Table 2. Economic Thickness. ½" Pipe
(D from Fig 1; k from Fig. 2; read thickness in inches.)

D= 0.0120



D= 0.0150



D= 0.0200

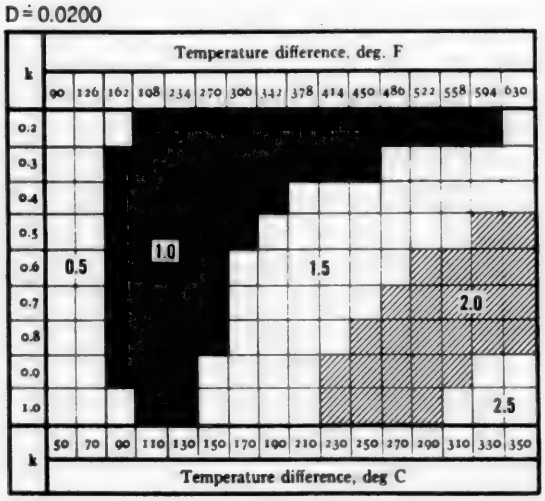
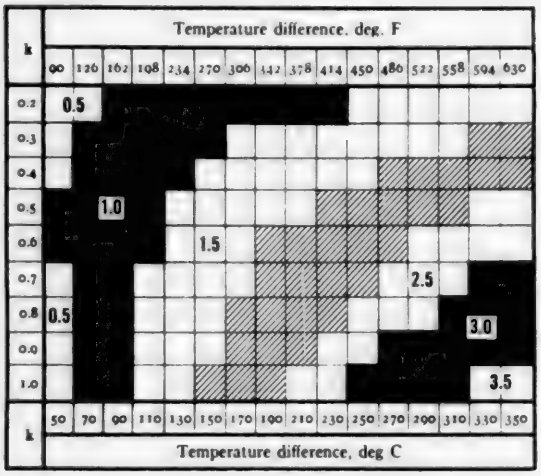
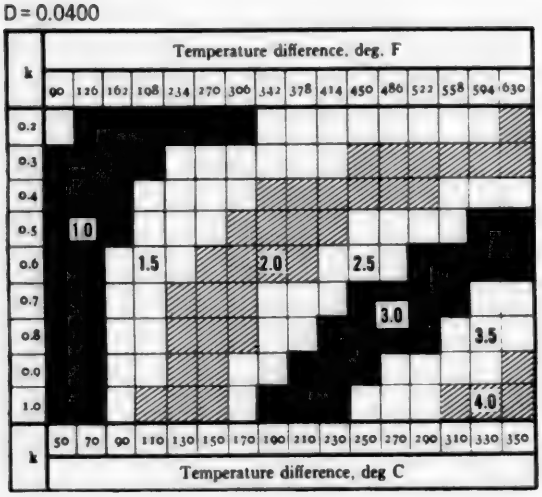


Table 2. Economic Thickness. **½" Pipe**
(D from Fig 1; k from Fig. 2; read thickness in inches.)

D = 0.0300



D = 0.0400



D = 0.0500

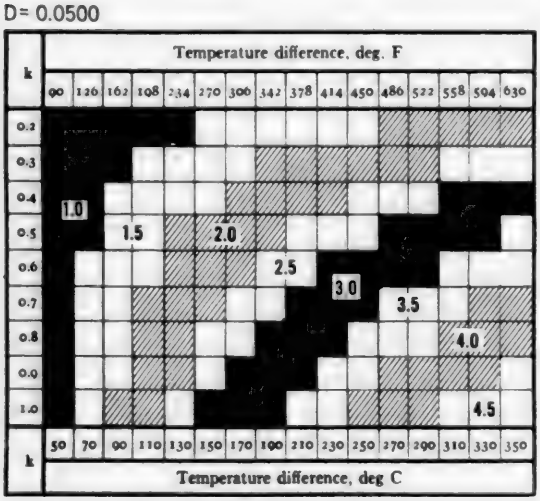
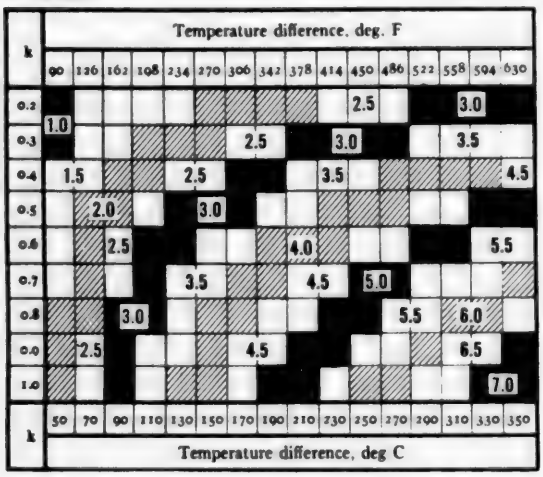


Table 2. Economic Thickness. **½" Pipe**
(D from Fig 1; k from Fig. 2; read thickness in inches.)

D = 0.1000



NOTE ON USE OF TABLE 2

Select temperature difference, fluid inside pipe less ambient air temperature, and read down. Select k value from Fig. 2 or from insulation manufacturer and read across. Where columns meet, read economic thickness of insulation in inches.

Table 2. Economic Thickness. **¼" Pipe**
(D from Fig 1; k from Fig. 2; read thickness in inches.)

D = 0.0045

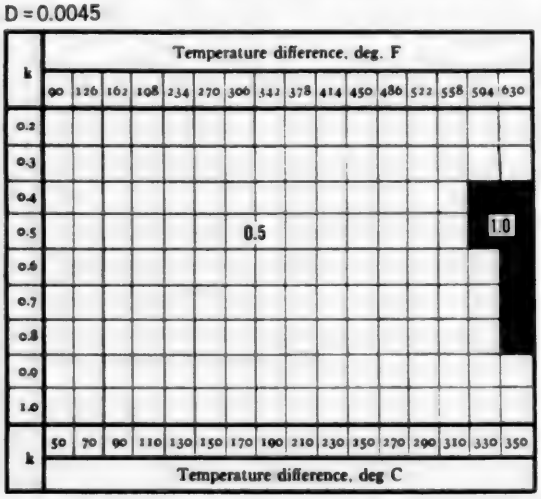
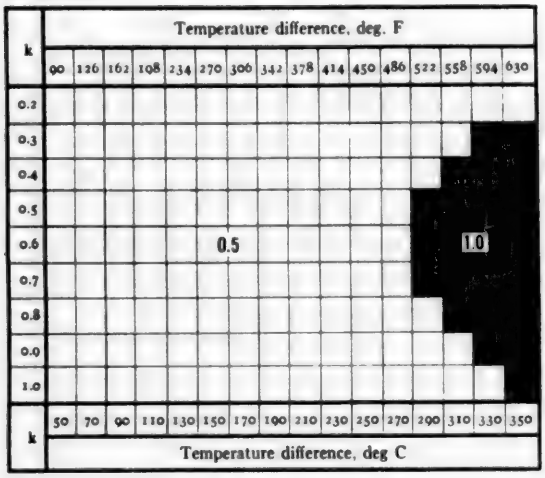


Table 2. Economic Thickness. **¾" Pipe**
(**D** from Fig 1; **k** from Fig. 2; read thickness in inches.)

D = 0.0050



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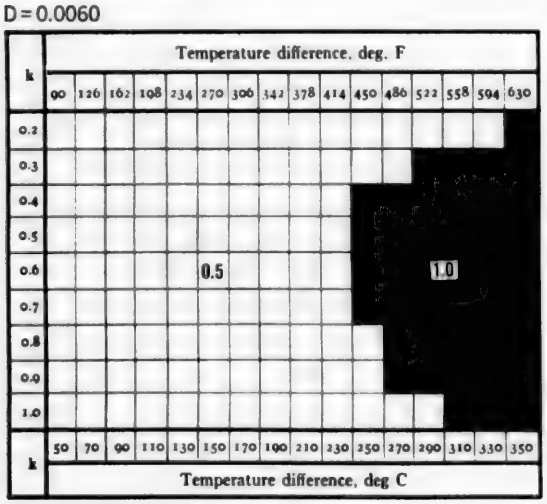

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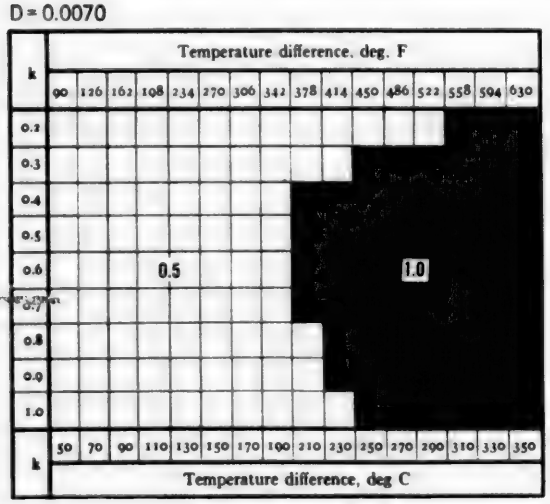

Table 2. Economic Thickness. **¾" Pipe**
(**D** from Fig 1; **k** from Fig. 2; read thickness in inches.)

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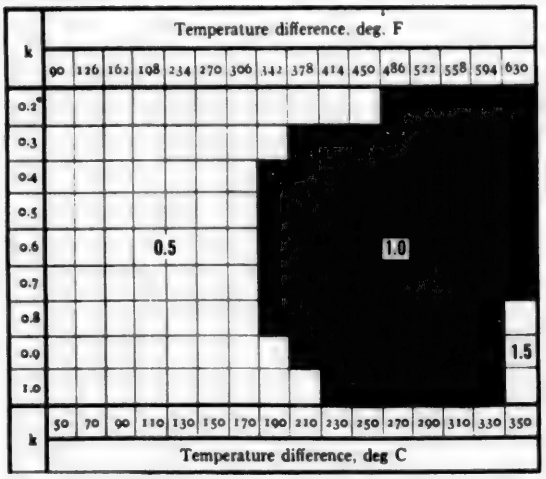
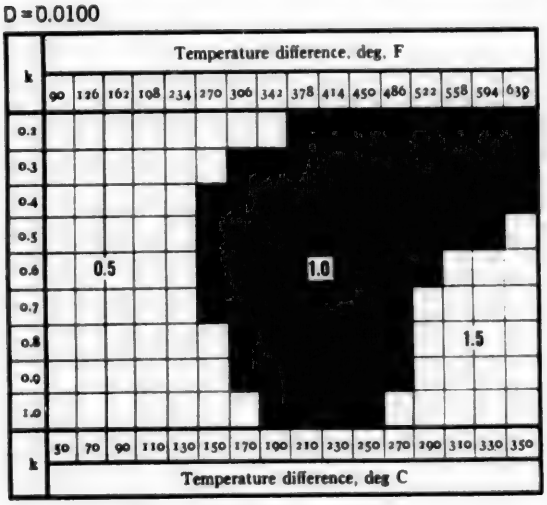


D = 0.0100



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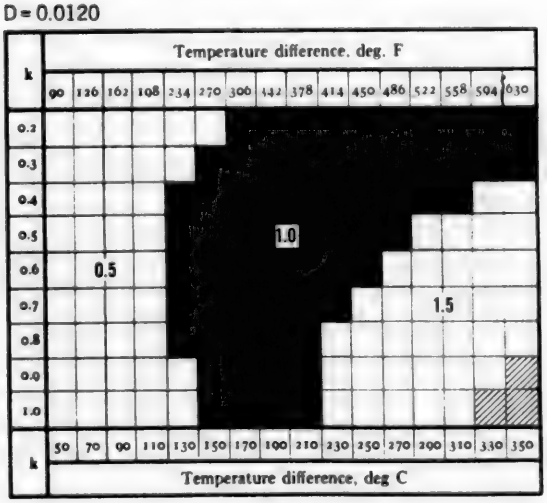

Table 2. Economic Thickness. **¾" Pipe**
(D from Fig 1; k from Fig. 2; read thickness in inches.)

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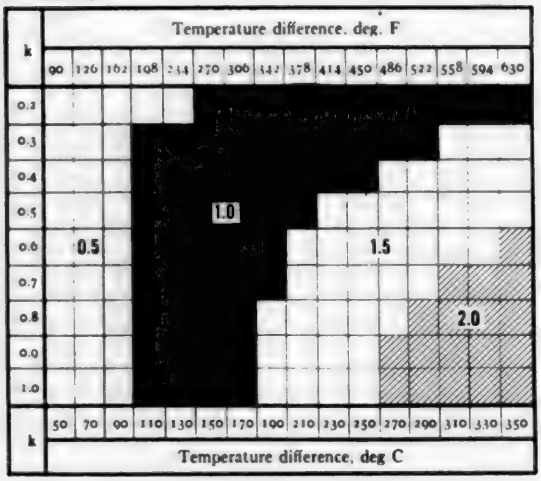

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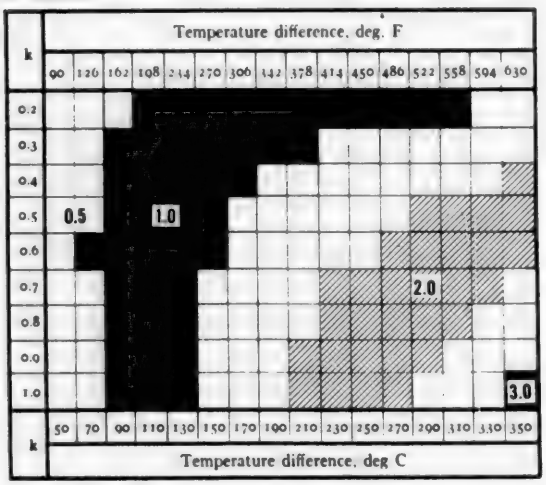

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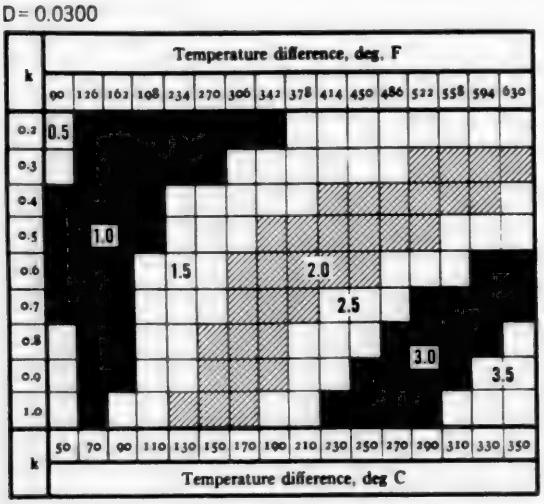

Table 2. Economic Thickness. **¾" Pipe**
(D from Fig 1; k from Fig. 2; read thickness in inches.)

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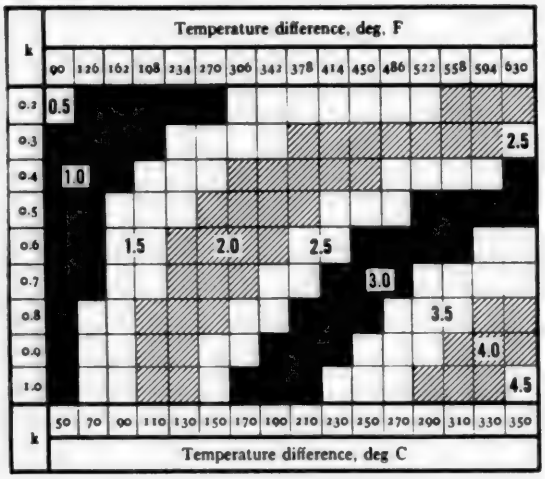
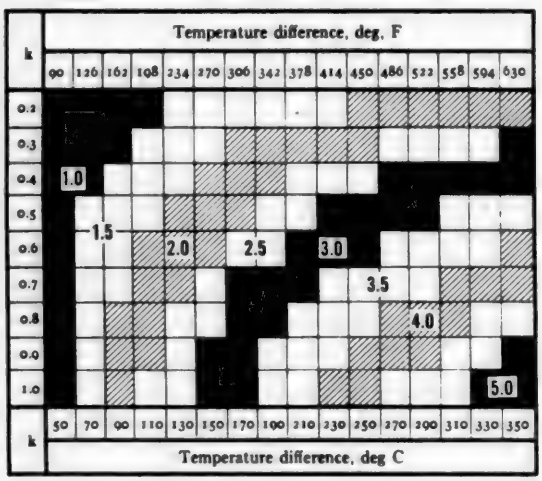


D = 0.0500



D = 0.1000

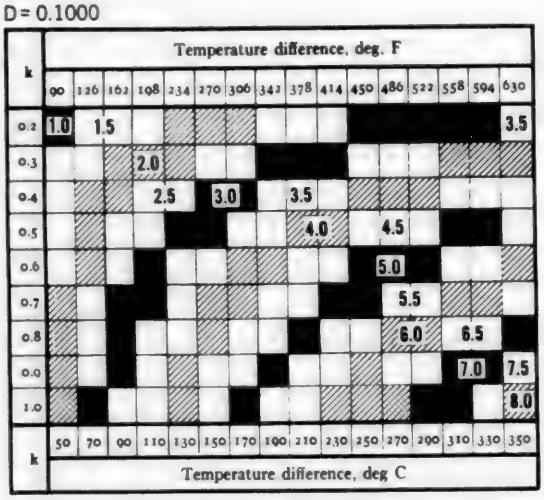


Table 2 continued next month.

Condensation problem is solved with new method for Swimming Pool Design

ROBERT E. DALY
Associate

and

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Ass't. Chief Mech. Engineer

Joseph P. Wohlpart Associates
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To simplify calculations and analyses in heating and ventilating design for indoor heated swimming pools, the authors developed a series of tables and charts herein presented. This is Part I of a two-part series. A working reproduction of the principle chart will be found on this month's Data Sheet, following.

EFFECTIVE CONDENSATION CONTROL and maintenance of a comfortable environment for both swimmers and spectators are the major problems facing the heating and ventilating designer of indoor heated swimming pools. These problems can be solved only when the direct relationship between moisture generated in the space and capacity of equipment utilized is known.

To be presented in a future article is a procedure for selecting and arranging construction materials to maintain all surfaces above the dew-point of the air in contact with wall and ceiling surfaces. It shall suffice to note, at this point, that the choice of materials is an integral part of design for condensation control and requires the closest collaboration between architect and engineer. In this article, it is assumed that the construction materials have been analyzed and correctly selected by the consultant.

The procedures herein presented evolved in the course of many years of experience in the design of swimming pools, without benefit of data in the engineering literature, which, after diligent search for information that could be readily utilized, was found to be sadly deficient on this subject. Determination of air quantity required to prevent condensation usually requires lengthy and involved calculations. It is the purpose of this article to present a series of tables and charts which may be used by the designer to simplify the procedures.

Variables

Pool water temperature, air temperature, air relative humidity, air velocity, outside air temperature, and humidity are items which must be determined or assumed to adequately design pool heating and ventilating systems. Table 1 suggests recommended inside conditions. Design outside data are available from many sources familiar to the reader. Water temperatures recommended vary from 72 to 80 deg F; air temperatures from 78 to 83 deg at an average velocity of 30 fpm for standard recreational pools. Special conditions may be required for pools used for hydrotherapy (see reference 5).

It is desirable to keep air motion within the pool area to a minimum to reduce the feeling of drafts on the unclothed swimmers and also to reduce the rate of evaporation, which increases with air velocity. On the other hand, increased air motion is desirable for the comfort of spectators.

Since air motion and temperature requirements are different for pool and spectator areas, a compromise between the two must be made. The choice will vary from project to project, depending on how the pool is utilized. This office generally uses the following compromise criteria as a basis of design:

1. Inside air conditions are maintained at 80 db, 60% rh, and maximum air velocity at 30 fpm.
2. Water temperature is maintained at 75 deg.
3. Control system is arranged to enable the pool owner to operate his pool over the entire range indicated in Table 1.

Following are the generally used standard design procedures:

TABLE 1—RECOMMENDED POOL CONDITIONS

POOL WATER CONDITIONS:	
Normal temperature range:	75-80 deg F
Range during competitions:	72-75
POOL AIR CONDITIONS:	
Dry bulb:	78-83 deg F (but not more than 5 deg above pool water temperature)
Relative humidity:	40-60%
Air velocity:	20-40 fpm

R. E. Daly (left) received his professional education at Tufts College and Boston University; served with the Zone Constructing Quartermaster of the First Corps Area as Assistant Chief Field Engineer, starting in the late thirties, and later with the North Atlantic Division of the U. S. Corp. of Engineers. In 1945, he returned to private engineering and in 1950 became an Associate in the Consulting Engineering firm of Joseph P. Wohlpart Associates. He is a member of NSPE.

Walter P. Bishop, associated with consulting engineering work for fourteen years, has been with Wohlpart Associates for the last ten years and is responsible for design of all heating and air conditioning work undertaken by the firm. He received his BME from New York University. He is a member of the N.S.P.E., Society of American Military Engineers, is a Captain in the Air Force Reserve assigned to the Civil Engineering Division of Olmstead Air Force Base, Pa., and is a registered professional engineer.

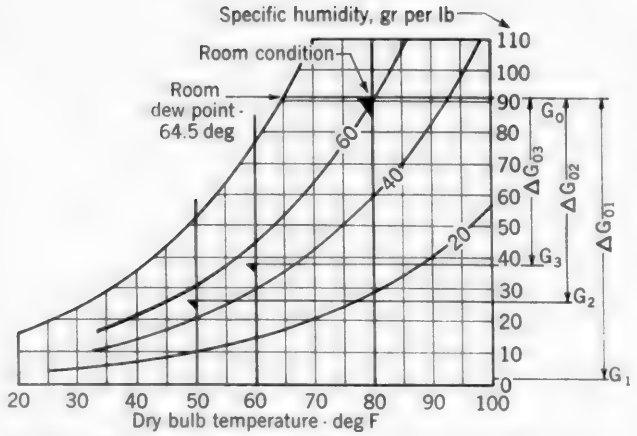


Fig. 2. Chart Fig. 2. Chart indicates moisture pickup capacity of outside air. Delta G is difference between outside air and room specific humidities.

1. For recreational swimming pools, heat for evaporation is assumed to come entirely from surrounding air. In pools used for hydrotherapy, heat for evaporation comes from the pool water. Therefore, in recreational pools, the capacity of the unit heating coil in the air supply includes the evaporation load, whereas *in therapeutic pools, the water heating system supplies that heat.*

2. Direct radiation is installed to offset heat losses through outside wall, floor, and roof. Usually, aluminum fins on copper tube, the radiation is recessed in the outside wall, with aluminum sheet metal enclosures and aluminum inlet and outlet grilles. It is zoned to maintain 80 deg.

3. The pool water heating system is sized to take care of normal transmission losses between pool and ground, along with the normal warm-up capacity.

4. The pool ventilating system consists of heating and ventilating unit interlocked with an exhaust fan. Unit capacity depends upon air requirement for condensation (usually small by comparison) and air required to maintain 80 db, 60% rh when outside temperature is high and the difference between inside and outside specific humidity is small, a condition requiring large amounts of air.

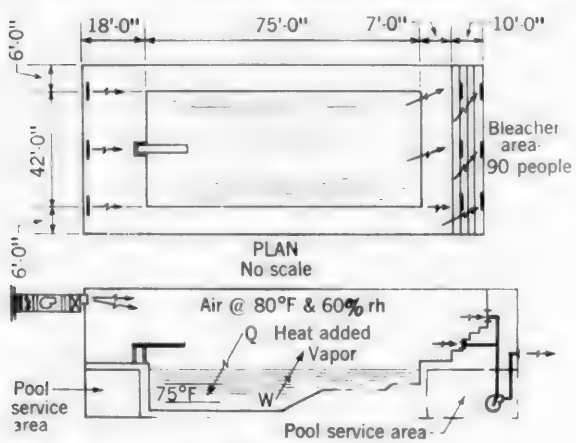


Fig. 1. Swimming pool in illustrative example.

5. Air supply consists of outside air intake, motorized damper, filters, preheat coil, fan section, and reheat coil. The supply air fan is two-speed, interlocked with a two-speed exhaust fan. Air is ducted to one end of the pool and exhausted at the other, producing a condition that approaches parallel flow over the water surface. This arrangement usually permits use of wall registers selected for large throw distances, which makes both registers and ductwork less expensive than with diffusers. Supply ductwork is usually designed for standard velocities, but exhaust ducts carry air between 1500 and 1800 fpm. Aluminum is used for both supply and exhaust ducts; anodized aluminum for supply and return registers.

6. Night set-back is set to prevent air temperature from falling below water temperature in recreational pools, that is, usually 75 deg. In one case, where the air was allowed to cool further, the pool water lost heat to the air, and it proved to be a false economy.

Theoretical Basis for Method

Design is based on the fact that, in winter, outside specific humidity, measures in grains per pound of dry air, is much less than inside specific humidity. When outside air, heated to room temperature, is introduced at one end of the pool and exhausted at the other end, it soaks up ambient moisture generated from the pool surface like a sponge. Air quantity to pick up evaporated moisture and maintain the required space conditions must be calculated.

The rate of evaporation from the pool water surface is a function of pool water temperature, room air temperature and humidity, and air velocity. Air moves across the pool in a pattern approaching parallel flow. Relationship of these factors is given in the

following equation, which permits the required calculations and is the basis of the graphs:

$$W = \left(\frac{95 + 0.425v}{\gamma}\right)(A)\ (p_w - p_a) \qquad (1)$$

$$W = k\,A\ (p_w - p_a) \qquad (2)$$

$$W' = 0.10\ (p_w - p_a) \qquad (3)$$

$$W'' = 700\ (p_w - p_a) \qquad (4)$$

where W = rate of evaporation, lb per hr,

v = air velocity over water surface, fpm,

γ = latent heat of vaporization at pool water temperature, Btu per lb,

A = pool surface area, sq ft,

p_w = vapor pressure, taken at the temperature of the water (saturation pressure), inches Hg,

p_a = vapor pressure of the moisture in the air at room temperature and relative humidity (partial pressure), inches Hg,

k = coefficient of diffusion, which for pool water temperature and air velocity (30 fpm) and air temperature ranges given in Table 1 is, at γ = 1050 Btu per lb, *approximately* 0.10.

W' = rate of evaporation, lb per (hr) (sq ft),

W'' = rate of evaporation, gr per (hr) (sq ft).

Example

Given a 42 x 75-ft swimming pool, Fig. 1, whose surface is 42 ft by 75 ft = 3150 sq ft. Volume of air space above the pool, V, is 160,000 cu ft. There are no windows, and the wall construction has been checked against the possibility of condensation. Inside conditions to be maintained: 80 deg and 60% rh.

To determine, by calculation and the charts, air quantities required to prevent condensation and maintain given inside conditions when outside air is

(a) 0 deg and 50% rh,

(b) 50 deg and 50% rh, and

(c) 60 deg and 50% rh.

Solution Without Chart

From the psychrometric chart (refer to skeleton chart, Fig. 2) find, for room inside condition of 80 db and 60% rh, that dew point is 64.5 deg, specific humidity, G, is 91 gr per lb, and from Table 2, that partial pressure, p_a = 0.6192 inches Hg.

From a table of the psychrometric properties of moist air, or from a psychrometric chart for low-temperature air, find that, at 0 deg and 50% rh, specific humidity is roughly 2 gr per lb. (Greater accuracy here would have no engineering significance.)

From Table 2, saturation pressure, p_w of moisture at the pool water temperature, 75 deg, is 0.8750 inches Hg.

When the specific humidity of the outside air (2 gr) is subtracted from the specific humidity at the design space condition, ΔG is found to be 89 gr per lb. The difference between p_w, saturation pressure at pool water temperature, and p_a, the partial pressure at room design conditions, is approximately 0.26 inches Hg.

Substituting these values in equation (1):

$$W = \frac{95 + 0.425(30)}{1050}(3150)(0.26)$$

W = 83.5 lb per hr moisture evaporated.

Q, the heat required for evaporation, is 83.5 lb per hr × 1050 Btu per lb = 88,000 Btu per hr.

To find the required air quantity, the rate of evaporation, w, is converted to grains per minute; the new W is divided by ΔG, the grains of moisture to be removed per pound of dry air, which gives the pounds of air per minute required to remove the moisture; this, in turn, is divided by standard air density, in pounds per cubic foot, which gives the ventilation air quantity in cubic feet per minute. Thus,

$$\text{CFM} = \frac{(w\ \text{lb/hr})(7000\ \text{gr/lb})(1\ \text{hr}/60\ \text{min})}{(0.075\ \text{lb air/cu ft air})(\Delta G)}$$

which reduces to

$$\text{CFM} = \frac{156\,W}{\Delta G}$$

Therefore, for part (a), with W = 83.5 and ΔG = 89,

$$\text{CFM}_{(a)} = \frac{156 \times 83.5}{89} = 1460$$

TABLE 2—VAPOR PRESSURES

Air Dry Bulb Temp., Deg F	Relative Humidity of Air, Percent* 20	40	60	80	Saturation Pressure, p_w at Water Temp.
	Partial Pressure of Air, p_a at Room Temperature				
60	.1044	.2087	.3131	.4174	.5218
62	.1120	.2240	.3361	.4481	.5601
64	.1202	.2404	.3605	.4807	.6009
65	.1244	.2489	.3733	.4978	.6222
66	.1288	.2577	.3865	.5154	.6442
68	.1381	.2761	.4142	.5522	.6903
70	.1478	.2957	.4435	.5914	.7392
72	.1582	.3165	.4747	.6330	.7912
74	.1692	.3385	.5077	.6770	.8462
75	.1750	.3500	.5250	.7000	.8750
76	.1809	.3618	.5428	.7237	.9046
78	.1933	.3866	.5800	.7733	.9666
80	.2064	.4128	.6192	.8256	1.9321
82	.2204	.4408	.6612	.8816	1.1016
84	.2350	.4700	.7050	.9400	1.1750
85	.2426	.4852	.7278	.9704	1.2133
86	.2506	.5012	.7518	1.0024	1.2527
88	.2670	.5340	.8010	1.0680	1.3347
90	.2844	.5688	.8532	1.1376	1.4218
92	.3026	.6052	.9078	1.2104	1.5131
94	.3220	.6440	.9660	1.2880	1.6097
95	.3320	.6640	.9969	1.3280	1.6600
96	.3424	.6848	1.0272	1.3696	1.7117
98	.3638	.7276	1.0914	1.4552	1.8192

* Strictly speaking, these are not relative humidities, but percent humidities. The difference, however, has no engineering significance in these applications.

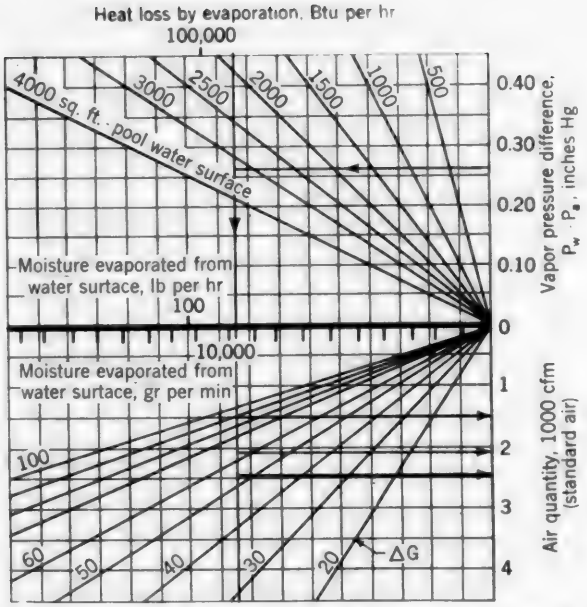


Fig. 3. Section of authors' chart illustrating its use in solving illustrative example. Full-size chart appears on back of blue data sheet.

Similarly, for part (b), where it can be shown that $\Delta G = 65$, and for part (c), where $\Delta G = 53$,

$$\text{CFM}_{02} = \frac{156 \times 83.5}{65} = 2000$$

$$\text{CFM}_{03} = \frac{156 \times 83.5}{53} = 2450$$

Solution with Chart

Once $(p_w - p_a)$ and ΔG are determined, solution by chart is very rapid. Figure 3 is a skeleton chart. The complete chart is reproduced on this month's Reference Data Sheet, immediately following. Entering the chart (Fig. 3) at the upper right at $(p_w - p_a) = 0.26$ and proceeding to the left (by interpolation) to 3150 sq ft pool water surface, then down to $\Delta G =$ (a) 89, (b) 65, and (c) 53, then reading out on the 1000-cfm scale, CFM = (a) 1500, (b) 2100, and (c) 2450. By inspection, it is seen that heat loss by evaporation is 88,000 Btu per lb and that 84 lb per hr or 9,800 gr per min of moisture is being evaporated from the water surface.

It is concluded that a fan with a minimum capacity of 2500 cfm is required for normal use.

Problems with Fixed Fan Capacity

Given the pool in the previous example (Fig. 1), how can the temperature and humidity range that could be served by a fan supply and exhaust system with outside air capacity of 8,000 cfm be determined?

Solving for ΔG in equation (5),

$$\Delta G = \frac{156\,W}{\text{CFM}}$$

From the previous example, W 83.5, therefore.

$$\Delta G = \frac{156 \times 83.5}{8000} = 16.2$$

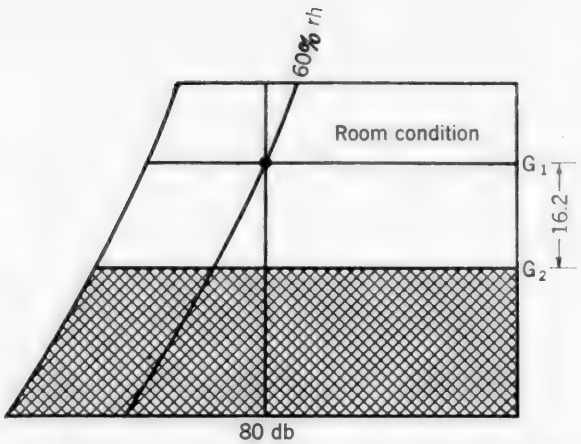


Fig. 4. Skeleton psychrometric chart illustrating its use in solving for ambient conditions handled by given ventilating system.

On a psychrometric chart, a skeleton of which is shown in Fig. 4, through the room condition of 80 db and 60% rh, draw a horizontal line, indicating the room specific humidity. Draw a second horizontal (constant specific humidity) line 16.2 gr per lb below the first. The area on the chart below the second line represents the range of outside conditions which will result in outside air of sufficiently low humidity such that 8,000 cfm of it will pick up enough moisture to maintain the specified inside conditions.

As stated at the outset, the design procedure herein presented evolved in the course of many years of experience. At the beginning, pool ventilating systems were over-designed, being sized on an empirical air-change basis. Each job was carefully checked, and in each of the early jobs it was found that air quantities were too large, resulting in excessive evaporation and excessive water heating.

At the St. Charles Borromeo Seminary in Pennsylvania, which was designed for a 16,000 cfm supply and exhaust, the system was later cut back to 12,000 cfm. At the Hotchkiss School, in Lakeville, Conn., the system, originally 12,000 cfm, was later reduced to 8,000 cfm. Tests conducted in winter at this latter installation, after the reduction, showed that fans were in operation only about 12 min each half hour. This confirms, in our opinion, the validity of equation (1) and the time-saving chart which is based upon it.

References and Bibliography

1. Fan Engineering, 5th ed, Buffalo Forge Co., pp 94, 95.
2. "Temperature of Evaporation", W. H. Carrier, ASHVE *Transactions*, vol. 24, 1918.
3. Air Conditioning and Refrigeration, Jennings and Lewis, 4th printing, 1953, pp 48, 49.
4. Mechanical Engineering Handbook, Lionel S. Marks, 5th ed, 1951, pp 1652-55.
5. Condensation Control Design for an Indoor Heated Swimming Pool, J. W. Barrett, *Air Conditioning, Heating and Ventilating*, Oct. 1958.
6. Swimming Pool Data and Reference Manual, 1960 ed, published by *Swimming Pool Age*, "A Guide to Better School Pool Planning", William Terry, pp 128-34.

SWIMMING POOL VENTILATION CHART

The chart reproduced on the back of this data sheet is designed to provide a rapid solution to the problems of sizing the heating and ventilating system for an indoor swimming pool. Developed by Robert E. Daly and Walter P. Bishop of Joseph P. Wohlpart Associates, New York, N. Y., the chart is based on the following formula, which assumes air supply entering at one end and being exhausted at the extreme other end of the pool, the air passing over the water in a condition approaching parallel flow:

$$W = \left(\frac{95 + 0.425v}{\gamma}\right)(A)(p_w - p_a)$$

where W = evaporation rate, Btu per lb,

v = air velocity over water, fpm,

γ = latent heat of evaporation at pool water temperature, Btu per lb,

A = pool surface area, sq ft,

p_w = vapor (saturation) pressure, taken at the water temperature, inches Hg, and

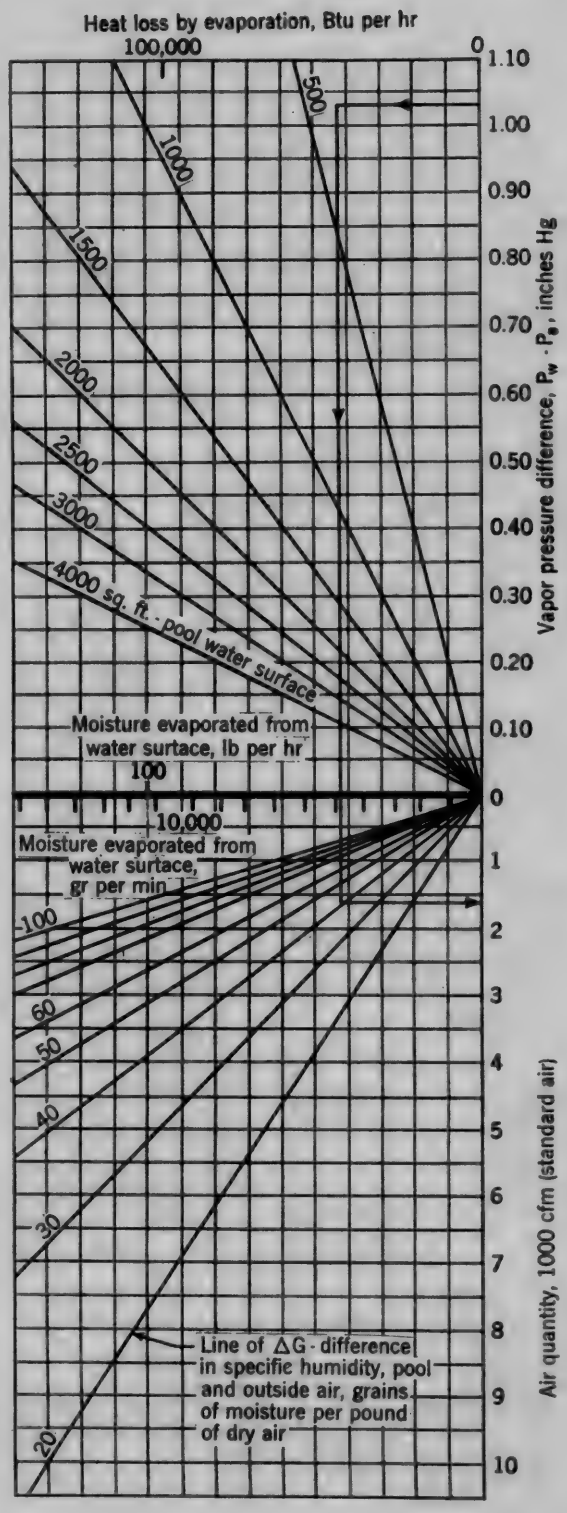
p_a = vapor (partial) pressure of moisture in room air, inches Hg.

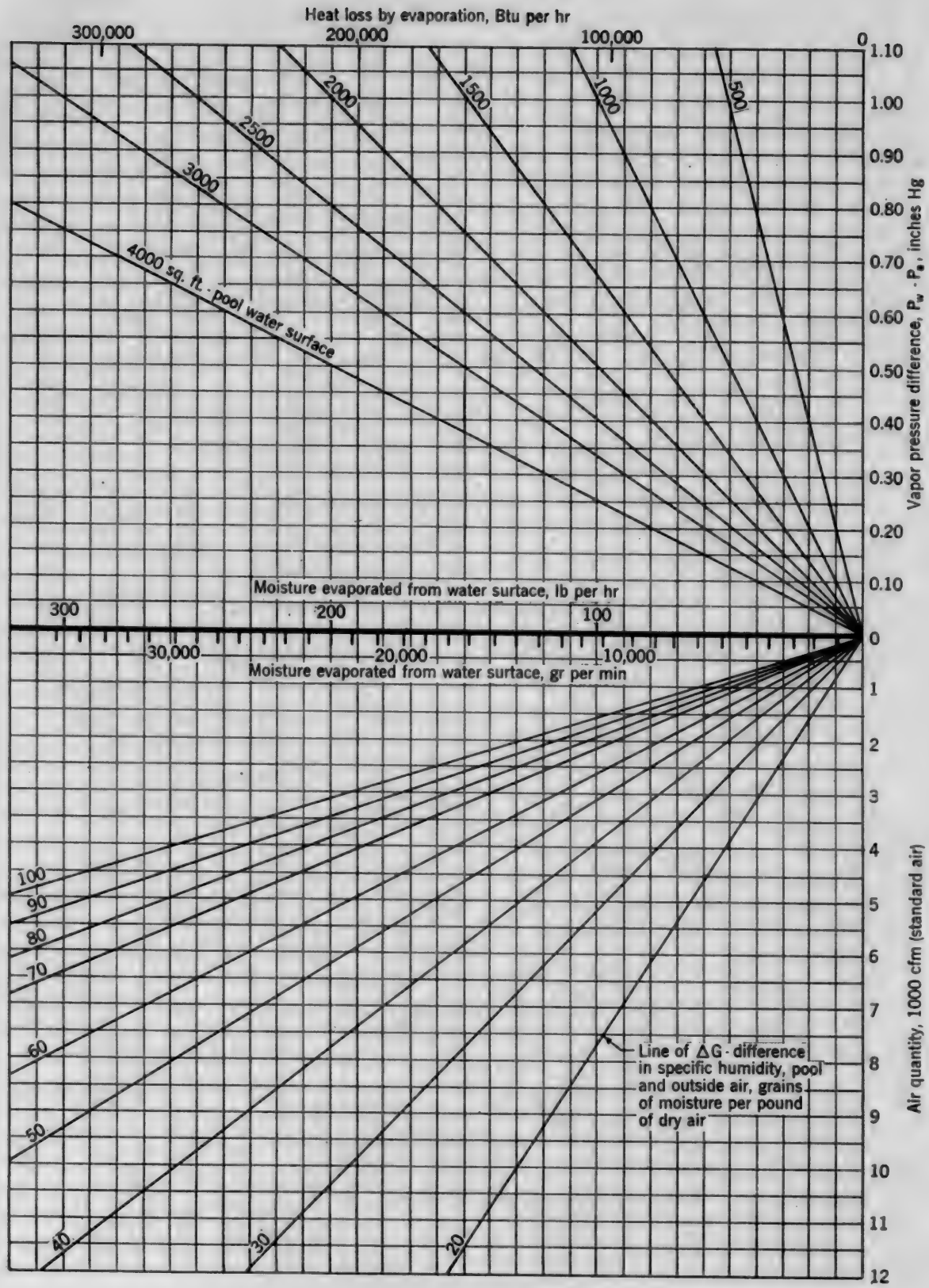
Example: Given an indoor pool used for therapeutic purposes; water temperature, 92 deg F; inside air, 92 db, 32% rh; outside air, 35 db, 100% rh; air velocity, 25 fpm; area of water surface, 430 sq ft.

From the psychrometric charts and tables, find that p_w, saturation pressure at 92 deg, is 1.51, and that p_a, partial pressure at 92 db and 32% rh, is 0.48, so that $(p_w - p_a)$ is 1.03. Also, that at the inside conditions of 92 db and 32% rh, G, specific humidity, is 74.5 gr per lb; and that at the outside condition of 35 db and 100% rh, G is 28.5, so that ΔG, the difference, is 46.

As shown at right on the skeleton chart, enter the chart at the upper right at $(p_w - p_a) = 1.03$, proceeding to the left until, by interpolation, the 430-sq ft pool water surface line is reached, then directly down to the $\Delta G = 46$ line (again interpolating), thence to the right, reading out at 1500 cfm, the required air quantity.

Note that all lines on the chart are linear and that it is plotted on arithmetic rectangular coordinates, so that by extending the line, the chart may be used for any size pool.




Heat loss by evaporation, Btu per hr
300,000
200,000
100,000
0
2000
1500
1000
500
2500
3000
4000 sq. ft. - pool water surface
Moisture evaporated from water surface, lb per hr
300
200
100
30,000
20,000
10,000
Moisture evaporated from water surface, gr per min
100
90
80
70
60
50
40
30
20
Line of ΔG - difference in specific humidity, pool and outside air, grains of moisture per pound of dry air
Vapor pressure difference, $P_w - P_a$, inches Hg
1.10
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0
Air quantity, 1000 cfm (standard air)
0
1
2
3
4
5
6
7
8
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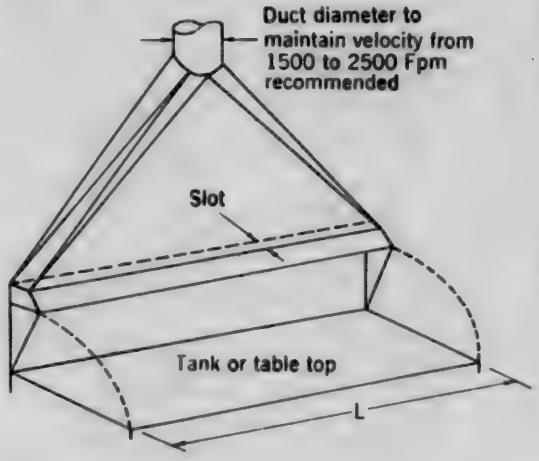
EXHAUST HOODS FOR INDUSTRIAL VENTILATION

Rear Hood for Open Surface Tanks



Notes:

$Q = W \times L \times K$

where Q = Air quantity required, cfm

W = Tank or table width, feet

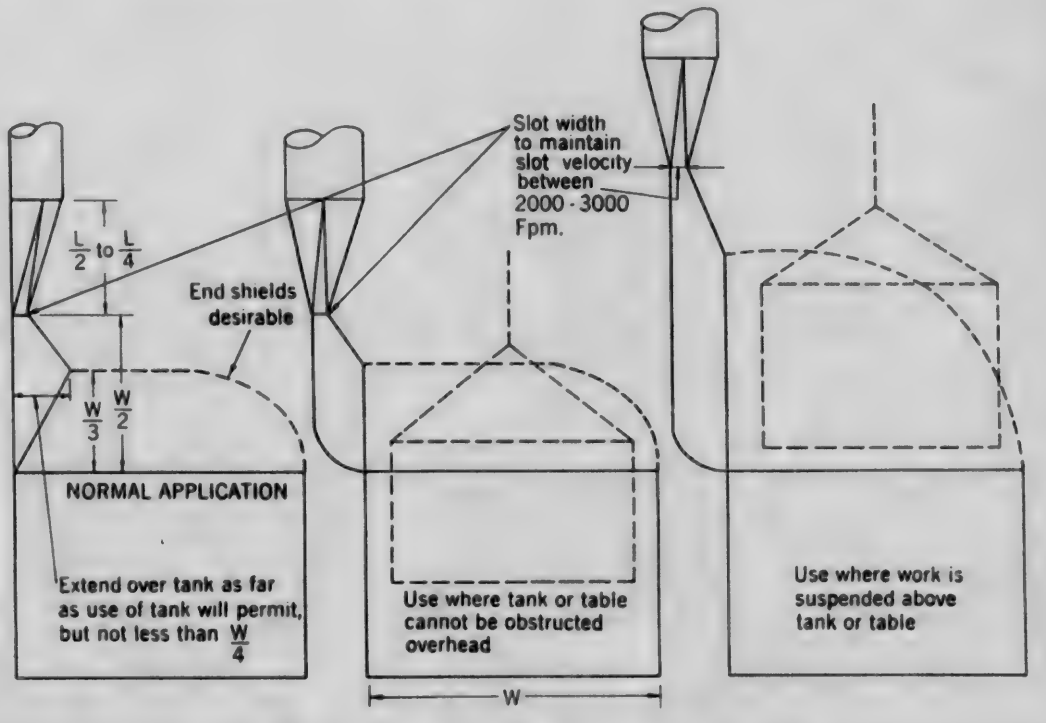
L = Tank or table length, feet

K = Ventilation rate, cfm per sq ft

Appropriate values of K can be determined from procedures outlined in the following references:

1. Industrial Code Rules 12 and 18 for Open Surface Tank Operations; Div. of Industrial Hygiene, New York State Department of Labor.
2. A.S.A. Standard Z9.1, "Ventilation and Operation of Open Surface Tanks."
3. "Industrial Ventilation"; American Conference of Governmental Industrial Hygienists.

Note: Maximum width W = 4 feet
Minimum ratio, length to width, L/W, 2 to 1
Maximum length of transition piece, 4 ft
(Use more than one for larger hoods)

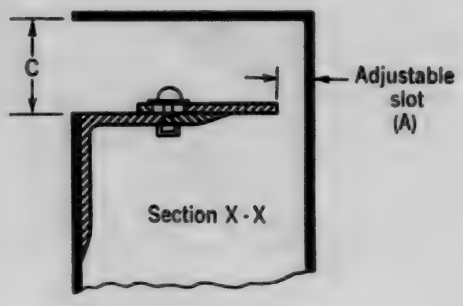

Slot width to maintain slot velocity between 2000 - 3000 Fpm.
L/2 to L/4
End shields desirable
W/3
W/2
NORMAL APPLICATION
Extend over tank as far as use of tank will permit, but not less than W/4
Use where tank or table cannot be obstructed overhead
Use where work is suspended above tank or table
W

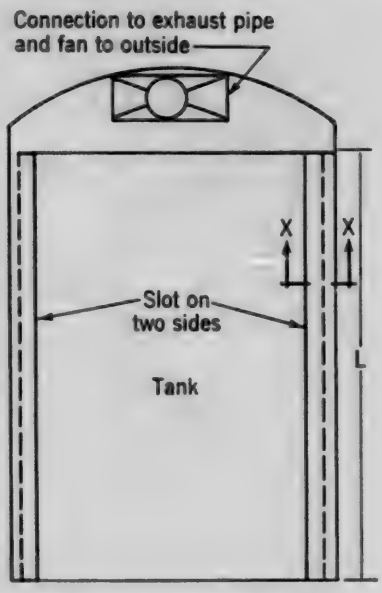
DETAIL SHEET—AIR CONDITIONING, HEATING AND VENTILATING

May, 1961

EXHAUST HOODS FOR INDUSTRIAL VENTILATION

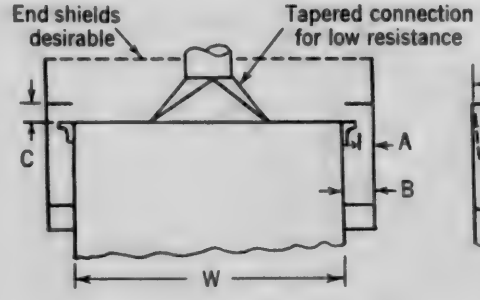
Lateral Hood for Open Surface Tanks

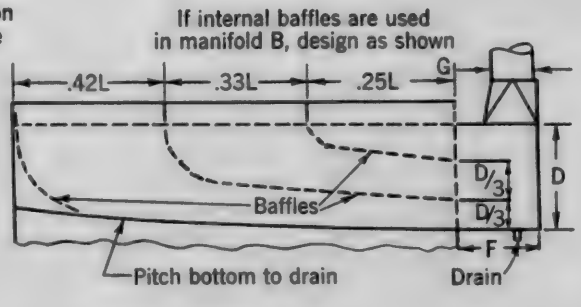




Notes:

1. Slot Velocities:
   Slot A. 1,000 to 2,000 Fpm.
   Slot C. 500 to 1,000 Fpm.
2. B and D manifold dimensions — as large as possible to give minimum velocity.
3. F at least 2½ B.
4. G pipe diameter to maintain pipe velocity between 1,500 and 2,500 Fpm.
5. Gas heated tanks shall have combustion chamber independently ventilated to outside.
6. Single slot on long side is permitted for tanks 18" wide and less.
7. Use slots along booth long sides for tanks wider than 18".
8. Internal baffles recommended for tanks over 6 ft. in length.





Drawings prepared by New York State Department of Labor
Division of Industrial Hygiene - Engineering Unit

DETAIL SHEET—AIR CONDITIONING, HEATING AND VENTILATING

May, 1961

A review of changes and improvements that have occurred in plumbing design, installation procedures, materials and equipment

What Have Been the Changes in Plumbing Over 20 Years?

JAMES C. CHURCH

Associate and Head of Sanitary Department, Syska & Hennessy, Inc., Consulting Engineers, New York, N. Y.

IT MAY BE refreshing to pause and examine what changes, if any, have taken place in plumbing over the past 20 years. By plumbing is meant design, installation, and the materials and equipment that are used, rather than any specific phase of that field.

Today's taller buildings, the higher costs of construction, and the increased amount of mechanical and electrical equipment in modern buildings have all had their effect on plumbing work.

Changes in Drawings

Before World War II, building design usually proceeded at an orderly, reasonable pace and final drawings were produced on cloth in ink. Also, at that time, there was plenty of space within a building for the required mechanical and electrical piping and equipment.

Then came the war. Everything was needed in a great hurry; design and production of drawings had to be greatly speeded, and drawings were turned out on paper in pencil. More often than not, the necessary speed required that the designer and the contractor worked practically side by side, issuing the work to the contractor piece meal, a drawing at a time, to help rush the ultimate completion of a much needed building. Of necessity, new methods and practices and new materials came into use in this period. Prefabrication and sub-assembly are only two of the means used then to speed work.

In the postwar era, unfortunately, building construction never came off the high speed, merry-go-round established during the war. Nowadays everything is always supposedly needed in a hurry. Even the production of drawings never returned to the former pre-war, orderly pace.

Since the use of pencil on paper drawings proved satisfactory and reproduction processes improved, the use of ink on cloth drawings has never returned, except in very isolated cases.

Tight Space Problems

The rapid rise in building costs in the postwar era has caused a tight squeeze on the mechanical space allowed within a building to achieve a cut on overall costs. However, in recent years, there has been an increased demand for space, brought about rather rapidly chiefly because of (1) increased use of air conditioning with the need for large ducts and ample machinery space requirements, and (2) the mushrooming of electrical systems. Both have caused additional design problems. Today work must not only be coordinated more closely and more carefully in the design stage to fit everything in the available spaces, but contractors find it necessary to make accurate layout drawings of their work, and composite drawings covering their installation and adjacent work before fabrication. This is necessary to avoid costly field changes. Gone is the era of "first in gets the space."

One of the solutions to the tight space problems, unfortunately, has been the placing of piping and ducts through instead of under beams. This has not only caused a great increase in the designer's work load in carefully locating and checking steel cuts and holes through beams, but it has also tied the contractor's hands as to where he can run his piping. It has taken away much of his previous freedom of movement in piping the job in the field.

Today's tight field conditions and greatly increased field labor costs have caused most contractors to add layout designers and draftsmen to their staffs to prepare detailed working drawings of the work before fabrication. The former method was to give the contract design drawings to the foreman so he could work out his problems in the field as he actually installed the piping. Time marches on!

Today's struggles to reduce building costs has also led to the use of numerous special slab construction schemes. Many give the contractor additional problems in locating sleeves and hanger inserts as the slabs can only be pierced or suspended-from at definite locations. Often this requires bridging, with angles or channels to support hangers in required locations. On the other hand, the development and use of new methods such as power-actuated stud drivers have aided in the anchoring of hangers and supports in masonry where regular inserts have been forgotten or misplaced.

Changes in Plumbing

Although the basic design principles of plumbing systems have not changed greatly over the years, the results of tests and added experience has, in some cases, resulted in more realistic and practical plumbing code requirements and sizing methods. Also with the passing of time, more and more communities have adopted plumbing codes to protect the public's health. Recent years have seen the production of many state plumbing codes, such as the New York State Plumbing Code. The New York code has been adopted by many communities in the state which either were without plumbing codes or were governed by antiquated ones.

The increased use of air conditioning has caused a tremendous increase in water consumption in buildings, even where water conserving devices such as cooling towers are used. Plumbing systems are called upon to convey the added supply and then to dispose of this water.

Drainage and Sewers

The increase in tall building construction has had a tendency to greatly tax street sewers and water mains. An added load is due to the increased use of water-supplied fixtures and equipment such as laundry washers, dishwashers and garbage grinders. Because of this increase in water usage, the plumbing designer must take added precautions: (1) that a possible resultant future drop in street pressures does not leave the top floors of a building short of water; and (2) that the surcharging of the sewers does not leave the building without constant basement drainage.

The biggest advancement in plumbing design has been the strong program for elimination of cross connections and potential cross connections between potable water supply systems and drainage systems. Those that cannot be eliminated are protected by vacuum breakers and/or check valves. Because of tragic occurences in the past, we are all very much aware of the potential health dangers caused by cross connections. Research is still going on in this field, and as a result, most plumbing codes have strict rules to safeguard the public.

Research Betters Conditions

Though plumbing design, in general, has not changed appreciably during the past twenty years, experience and research have produced a greater knowledge of drainage and vent systems, particularly in very tall buildings. This added data have enabled better, more practical, workable, and economical designs.

Similarly, experience and research have bettered our know-how regarding peak water demands and hot water usage in various types of buildings. This has improved efficiency and economy of design through correct sizing of piping and hot water heaters.

There still remains more to be known about the actual internal workings of these systems, before we can feel sure that we know all the exact answers to these complex subjects.

Material and Equipment

The past 20 years has seen great advances in the use of new materials and in new uses for old materials. For example, in acid waste drainage systems, Pyrex glass pipe and plastic pipe are making great inroads on the old standard Duriron pipe; TP copper tubing with brazed joints has increased in popularity for water piping; there has been an increased use of Transite pipe for water mains and sewers.

Pumps and similar types of equipment used in plumbing systems have been improved. The changes include smaller units, better bearings and mechanical seals. One good example of these improvements is the advent of the submersible motor which has led to submersible well pumps, submersible sump pumps, and submersible sewage ejectors. All are very advantageous in many of today's projects.

A big stride has been made in the field of water level control with the development of electrode controls for tank fill pumps, sump pumps and sewage ejectors. Electrode controls have eliminated some of the moving parts in the mechanical equipment of the building. This reduction in moving parts has cut maintenance.

Plumbing Fixtures

No great strides have been made with plumbing fixtures other than the possible streamlining of lavatories and the elimination of pedestals for their support. A recent trend in bathrooms is to use lavatories set in cabinet tops.

The biggest single advance in toilet room design has been the popularizing of the wall hung water closet. This type closet, together with ceiling-supported water closet stall partitions, have left a clear floor in the toilet room, for better sanitary maintenance. Development of the combination water closet support carrier and drainage pipe fitting has advanced the popularity of wall hung water closets.

A new fixture developed in recent years is the woman's urinal; however, this fixture has yet to gain much popularity.

The swing in recent years to stainless steel for plumbing fixtures has shown up not only in kitchen sinks, but also in drinking fountains, lavatories, and many specialized types of hospital fixtures.

Aluminum also has made its debut in the plumbing fixture field with the use of aluminum water closets and lavatories in prison cells where the more rugged all-metal fixtures show many advantages.

Chilled drinking water systems have undergone many advances in recent years. Not only has the development of the hermetically sealed refrigeration unit made possible smaller, more trouble-free units, but the placing of a small refrigeration unit and cooler in a wall recess under the drinking fountain, has made chilled drinking water installations practical where central circulated systems were not economical and the appearance of unit water coolers undesirable.

What every owner-client ought to know
——by a consultant in private practice

"furnished by others"— Proceed with Caution!

ANTON KRAPEK

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BECAUSE OF THE COMPLEXITY OF EXTREMELY SPECIALIZED equipment, an owner often insists upon furnishing this equipment directly to the contractor for the installation. In lieu of the necessary information relative to this equipment, the engineer or architect is forced to state in the specifications that it will be "furnished by others" and indicate that the contractor will provide the required services, including rough-in and final connections.

The owner ought to be forewarned of the fallacies of furnishing equipment he has purchased direct. The engineer, lacking the data, is told to furnish specific services, but is not told where they are required. More likely than not, the rough-in ends up at the opposite end of the space in which the equipment is located. The owner must then be asked for an extra to change the original work, often an occasion for misunderstanding and friction. In the case of slab-type construction, project progress may be held up for the sake of drawings required for a single piece of equipment.

Experienced contractors often hesitate to bid on jobs housing a lot of specialized items. Previous experience tempts them to add to their bids to cover such contingencies, knowing that if they do, they may lose the job entirely. The successful bidder prays that the drawings are somewhere near right.

Despite all the time given to guesswork planning, the "furnished by others" clause consumes excessive amounts of both the engineer's and contractor's time. Each time an item has to be roughed in, the engineer is called to meet with the contractor on the site to determine proper locations of stubs. The owner is also called. Each call irritates each of the parties. Finally, the owner, for the sake of self-preservation, tells the contractor to use his own judgement and get the job done! The sequel is often extras, and unsightly, long equipment-to-stub connections that irritate the owner even more.

Demand Proper Shop Drawings!

If an owner insists on furnishing certain items, as a very minimum the engineer ought to insist that proper shop drawings be supplied by the manufacturer of each item so furnished so that all work may be shown clearly on the bidding documents. Certainly, the owner must have a rough idea of his needs, and since he has already contacted the vendor regarding price, he might just as simply ask for rough-in drawings. If he wishes to have a number of manufacturers bid on specialized equipment, the bidding should take place during the planning period and drawings obtained. Then the designer may know what to include concerning piping and loads, these being included in the main piping systems; the contractor need not guess rough-in locations; and the owner gets a complete installation.

Let the Contractor Furnish It!

Today's modern building practices require a full measure of contractor-engineer-architect coordination. Under the most favorable conditions, small conflicts arise, but a reasonable amount of conferring by those involved permits construction to proceed rapidly. However, the "furnished by others" procedure adds to the friction in almost every phase of the work.

Even when the owner can state, with justification, that he alone knows his particular needs, he can just as well have all equipment included in the contract. When he does, the contractor assumes full responsibility for not only the installation but the operation of the items furnished under the contract. The contractor's responsibility does not end with final connections, as it is with "furnished by others" equipment. The profit a contractor adds to the cost of equipment furnished by him as part of the contract adds little to overall project cost, yet this profit pays for the necessary guarantees of performance the contractor has agreed to provide. Architectural and engineering fees are also increased somewhat, but here again, over-all planning of a complete job provides a favorable return to the owner, since correctness of layout becomes their responsibility.

A Special Case

In the case of special process units designed for, and constructed to the specifications of, an owner, it is still possible to derive the benefits of contractor responsibility, although the owner has furnished the equipment. Bidding documents can permit the contractor to add a percentage of the purchase price of the equipment furnished by the owner, providing

Anton Krapek, a naturalized American citizen, was born in Czechoslovakia. Following two years of service with the Army Air Forces he attended Alma College of Alma, Michigan and received his BSAE degree from the Aeronautical University of Chicago. In 1952 he was employed by E. Roger Hewitt, consulting engineer, and received his professional engineer registration in Michigan in 1955. The following year he was registered in the State of Indiana. In January, 1957 the firm of E. Roger Hewitt Associates, Inc. was formed and Mr. Krapek was elected to the office of vice-president, an office he still holds. Present duties include design, layout and supervision of heating, air conditioning, plumbing, ventilating and process piping systems for a wide variety of commercial and industrial projects in the heavy construction field.

reimbursement to the contractor for uncrating, erecting, and hooking up each item. Performance guarantees can be included as part of the services rendered for the percentage, as can the often necessary returns to a project for minor operating adjustments. Shop drawings are easily obtained in this case, permitting architect and engineer to incorporate all rough-in information on the plans. Guesswork is eliminated and construction is unhampered.

Items to Watch

In preparing plans for various buildings, the following list may be helpful in determining the possible services required by equipment that often falls into the "furnished by others" category:

Sterilizers: hub-outlet waste, steam, vent to atmosphere, cooling leg, strainer, trap, pressure reducing valve, shut-off valve.

Distillers: steam, cold water, hub-outlet waste, cooling leg, strainer, trap, pressure reducing valve, shut-off valves.

Dental chairs: cold water, waste, air, gas, valves.

Commercial washers: hot water, cold water, safe waste, shock arrestors.

Extractors: safe waste.

Commercial presses: steam, pressure reducing valves, strainers, traps, over-head cold water spray, valves, flash tanks, condensate return.

Flat work ironers: steam, pressure reducing valves, strainers, traps, forced ventilation, valves, flash tanks, condensate return.

Dryers: gas, valves and forced ventilation or steam, pressure reducing valves, strainers, traps, valves, flash tanks, condensate return, forced ventilation.

Dishwashers: gas, cold water, hot water, waste, valves, forced ventilation or steam, pressure reducing valves, traps, strainers, condensate return, cold water, hot water, waste, valves, forced ventilation.

Kitchen equipment: gas, steam, condensate return, cold water, hot water, forced ventilation hoods, etc.

Laundry chutes: cold water, waste, gravity ventilation.

Laboratory tables: cold water, hot water, waste, vacuum breakers, valves, gas with master shut-off.

Fume hoods: gas, valves, forced ventilation.

Waste disposers: cold water, waste, valves, flow switches.

Walk-in coolers: refrigeration equipment, drip-pan waste to safe-waste outside the confines of the cooler.

Developing tanks: cold water, hot water, tempering valves, thermometers, tempered water, vacuum breakers, waste, valves.

Art room sinks: hot water, cold water, valves, waste, plaster traps, counter installation over-lap rim, supply trim.

Hospital or clinical lavatories: hot water, cold water, waste, valves and any combination of supply trim with wrist blade, knee or foot operated controls.

Fuel oil tanks: oil supply and return, fill cap with hinged cover, tank gauge, atmospheric vent, possibly oil preheating equipment and tank ballast.

Waste oil tanks: floor fill or dump sink, straight run vertical pump-out piping, tank gauge, atmospheric vent, possibly a vent flame arrester and tank ballast.

Gasoline tanks: pump piping, fill cap with code approved cover, tank gauge, atmospheric vent with flame arrester, possibly grounding devices and tank ballast.

Hose reel distribution for automobile servicing: oil, grease, water and anti-freeze piping, shut off valves, dispensing devices, air operated oil and grease pumps, bulk storage drums.

Oil and grease bulk storage room: floor drain connected to waste oil tank, gravity ventilation or explosion proof forced ventilation.

Automobile hoists: underground air or oil piping and possibly liquid waste and foul air ejectors.

Carbon monoxide exhaust systems: underground duct work, flush floor outlets, squirrel cage exhaust fan, atmospheric discharge, tail pipe adaptors for single and dual exhaust vehicles, crush proof hose, hose-end duct guides.

Steam cleaners: oil or gas piping, steam piping, hose, cleaning devices, cold water, relief valve, breeching.

Obviously, the above list represents only a small number of the items available but those listed are most generally encountered.

Four Alternatives

To sum up, the owner, in all fairness, should be told exactly what he has to contend with in whatever method he chooses, that is:

(a) Furnished by others, less shop drawings: construction delays, improper rough-in, extended final connections, no guarantee of performance as well as no adjustments.

(b) Furnished by others, with shop drawings: proper rough-in and final connections, no construction delays, no guarantee, no adjustments.

(c) Furnished by the contractor: slight additional cost, proper rough-in and final connections, performance guarantees, operation adjustments.

(d) Furnished by others with percentage mark-up: same as (c) above plus owner satisfaction of providing equipment of his own selection.

Vapor Problems with Insulation

Vapor barriers can be made perfect. Will they stay that way? What to do when the pressure potential shifts back and forth.

WHEN ANY PART OF INSULATION (including the insulation closest to the cold surface and the cold surface itself) is at a temperature below the dew point of the ambient with which it is in contact a (water) vapor barrier is required. The type of barrier, and how nearly perfect it must be, depends on many factors.

When water condenses at a point on a surface, the vapor pressure in the neighborhood of that point is reduced. If more water vapor can move in from the ambient, condensation will continue indefinitely. The water moves continually, although possibly slowly, toward the point of lowest temperature unless there is some barrier to stop it. Below 32 deg, ice forms. If the temperature is below about 15 deg the ice is likely to be in the form of frost.

An accumulation of frost in the pores or cracks of insulation may not reduce its effectiveness. However, if the insulation warms up, this frost will melt and liquid may accumulate in small quantities. Upon refreezing, it expands and may result in serious damage to the insulation. I've seen cases where it caused cork insulation to break away from the pipe.

When insulation is applied directly to a pipe or a tank, and where the ambient dew point is above the temperature of the fluid in the pipe or tank, the vapor barrier must be as nearly perfect as possible because condensation in or under the insulation never leaves the insulation.

Some insulating materials are composed of a multiplicity of sealed air cells. Sometimes the cells contain gases other than air. Even such insulating materials, though impervious to water vapor, are not usually applied continuously. All breaks or joints must have a proper vapor seal or water vapor will enter and condense or freeze either in the joint or between the insulation and the pipe.

When using molded cork insulation for piping, we make a practice of applying a vapor barrier across the end of the insulation, every three or six feet of length. This consists of cut-out annular pieces of asphalt impregnated paper, lapped and well tarred to the pipe and the outer vapor barrier. This assures that a break or defect of the outer vapor barrier will not allow moisture to move down the length of the insulation. The main vapor barrier is always subject to damage, as when a workman leans a ladder against it. Vapor barriers at short intervals localize the damage.

Vapor Barriers May Not Remain Impermeable

One problem with large and irregularly shaped vapor barriers is to make them perfect and have them stay that way. Expansion, contraction, and the effects of time often cause defects in an originally satisfactory vapor barrier. Therefore it is well to make provision for water vapor, that does enter through our vapor barrier, to escape.

One of the first cases where we used an arrangement of this kind was in the insulation of a cold storage room on a remote farm in Argentina. Labor and bricks were relatively low in cost. Cork or any other standard insulating materials were expensive, but the owner told me he could get all the cinders he wanted from the railroad at the cost of carting them about six miles. He wondered if we could use them as insulation. I didn't have any very accurate data but, from that available, I felt certain that 10 inches of dry cinders would be equal to at least 4 inches of cork. The temperature in the locality almost never goes below 30 deg F. Since the interior dew point would always be at least as low as 30 deg (the room was to be kept 34 deg or below) there would be no tendency for water vapor to move from the room toward the outside, into the insulation, even in the coldest weather. Any vapor pressure difference would always tend to move moisture from the outside, in.

The structure had a double-brick outer wall, covered on the inside with a layer of tar paper, well lapped and tar coated. A vapor barrier on the outside of the brick would be the first choice, but it would not be so well protected. The vapor barrier on the inside of the brick was satisfactory because the temperature drop across 8 inches of brick was a very small part of the total.

Leaving a 10-inch space, afterward filled with cinders, an inner wall was built of brick on edge, covered on the inside with a smooth coating of cement. A one-inch hole (with screen behind it to keep the cinders in place) was left every 3 ft so that there was one in every 9 sq ft of wall. No holes were cut in the lower 3 ft so that the floor could be washed easily without getting water into the insulation.

With this arrangement, it was difficult for moisture to get into the insulation and easy for it to leave and deposit itself on the refrigerated cooling surface. The cold storage room performed very satisfactorily, even when meat was stored at –10 deg.

The foregoing method of building a cold storage room illustrates the proper arrangement of vapor barriers when the vapor pressure difference is always in one direction. It is so arranged that moisture cannot easily enter the insulation, but can easily leave it. (Use of cinders in the manner described is usually the expensive way of doing the job. Only relative costs in that locality justified its use.)

Following are a number of other places where moisture in insulation is controlled by using a vapor barrier on one side and venting the other:

1. *Insulation between the walls of a residence.*

The important vapor barrier is the one between the interior of the house and the insulation. Good building paper, which is a vapor barrier, will be needed between the insulation and outdoors to keep out rain and snow, but the insulation should be vented to the roof space and left with definite openings to the outside at some protected point such as under the eaves.

Since inside temperature, in warm weather, even with air conditioning, will never be below 75 deg and the outdoor dew point will seldom, if ever, exceed 75 deg, there will never be any tendency for water to condense in the insulation from outside. In cold weather, vapor pressure in the insulation can never rise above the insulation temperature because, with a reasonably good barrier inside and venting to outside, vapor pressure in the insulation will be very near that of the outside air.

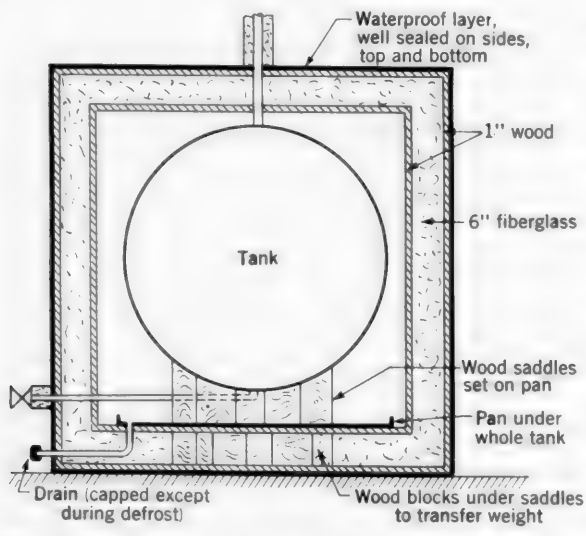

Waterproof layer, well sealed on sides, top and bottom
1" wood
6" fiberglass
Tank
Wood saddles set on pan
Pan under whole tank
Drain (capped except during defrost)
Wood blocks under saddles to transfer weight

Fig. 1. How to insulate a tank of carbon dioxide. Moisture that gets past vapor barrier freezes on tank. During shut-downs, the tank defrosts and water is drained off.

2. *Insulation for an altitude chamber.*

Insulation may be placed inside the pressure-tight casing and vented to the inside if inside dew points do not rise above the temperature of the outside ambient. Suggestions on what to do if a chamber is to be used for dew points above the temperature of the outside ambient are given later in this discussion.

3. *Multiple glass window for altitude chamber.*

Where the required inside dew point is never above the temperature of outside ambient, a single, sufficiently thick tempered glass is set on the outside. Its sole function is to hold the pressure difference. A gasket is placed between it and the chamber, so that the lower the pressure inside, the tighter the seal.

Inside are ten additional panes of ¼-inch plate glass, ½ inch apart, in a plastic frame. Vent holes in the frame between each pane vent to the interior. Since inside vapor pressure is always below that corresponding to the temperature of any pane, no condensation (fogging) takes place.

The outermost pane is never more than 10 deg below the ambient, even when the total difference between the ambient and the chamber is 180 deg. Thus it is free from temperature stresses, the inner panes taking care of the temperature difference without pressure stress.

4. *Tank for liquid carbon dioxide.*

A tank about 6 ft dia by 15 ft long was to hold liquid CO_2 at –20 deg. The owner wished to insulate it with fiber glass because it was considerably lower in cost than any rigid, relatively water resistant material. However, its application to the tank and the making of a vapor barrier that would remain impermeable seemed impractical. The job was done as shown in Fig. 1.

The outer waterproof layer is as good a vapor barrier as possible and runs continuously under the saddles. Any slight amount of water vapor that does get past the barrier becomes frost on the tank itself. Every year or so, when cleaning or maintenance requires a shutdown, and the empty tank warms up, the drain is uncapped and any water present is removed. An access is provided which requires breaking the vapor barrier, but it is easily re-sealed.

Varying Dew Points and Temperatures—Both Sides

The more difficult problem occurs when the dew point on the inside is higher than the temperature of the outside air part of the time, and the dew point on the outside is higher than the temperature of the inside air the rest of the time. In these cases, the arrangements just described, with a vapor barrier on one side and the insulation space vented to the other, are useless.

Fig. 2. Altitude chamber is difficult to insulate because vapor pressures are alternately higher inside and outside. Vents which can be open and shut at will must be provided in the barriers on each side.

An example of this is a chamber in which the inside conditions to be maintained include temperatures well below the outside ambient dew point and also dew points well above the outside ambient temperature. When the inside temperature is low, any vapor which gets in from the outside, into the insulation, will condense or freeze there. When a high inside dew point is maintained, the vapor must be kept from moving from the inside, into the insulation.

An obvious solution would seem to be a perfect vapor barrier, inside and out. Where this is practical, it is certainly the logical method. However, it is often a difficult or impossible job to provide such vapor barriers on both sides and have them remain practically perfect during the varied conditions of operation.

A case in point is a chamber that was built for an equipment manufacturer which required, before acceptance by the purchaser, testing at temperatures of about –100 deg, high altitude conditions of less than 0.5 psia, and dew points as high as 90 deg. Because of the low-pressure requirement, the outer shell is ¼-inch steel sheet and is certainly an excellent vapor barrier. An attempt was made to seal the inside by covering it with stainless steel sheet, with all joints welded. Whether or not it was a perfect seal initially, I don't know, but there was no possibility of it staying tight. Extreme, unevenly distributed temperature changes cause severe stresses in the stainless steel lining and may crack it. Any air or other gas between the ¼-inch outer shell and the stainless steel inner barrier, will cause rupture of the stainless steel when the chamber pressure is lowered. In practice, the chamber proved useless for high interior dew points.

There is a solution to those cases where a vapor barrier is required on one side part of the time, on the other side at other times, and it is impractical to have a perfect one on both sides all of the time. Each barrier must be reasonably good, but vents, which can be opened at will, must be provided in each barrier. When requirements are for a high chamber dew point, the interior vents will be closed and the exterior ones opened. The dew point on the exterior will be lower than the temperature of any of the insulation so that accumulation of water will be no problem. If a low chamber temperature or pressure is required, the outside vents will be closed and the interior ones opened. If the chamber has a multiple glass window, the spaces between all the panes should be vented to one side and sealed on the other in the same manner as the insulation.

In the case of the test chamber, the vents in the ¼-inch outside shell would probably be pipe nipples with caps, good valves or something similar, to assure the required seal when low inside pressures are required. The interior vents need not hold such pressure differences but, if the chamber is to be evacuated for high altitude simulation, they must be large enough in total cross section, to keep the pressure in the insulation from remaining so high above the chamber pressure during evacuation, that rupture of the inner barrier results.

Basically, to avoid moisture problems in insulation: (1) Use a material which is continuous and impervious to moisture indefinitely, as may be possible with some of the new foamed-in-place insulations. (2) Use a practically perfect barrier on both sides. (3) Use a good barrier on the side needing one and vent the other side. (4) Use a good barrier with vents which may be closed on both sides, and arrange the closing and opening of vents to suit conditions.

Requirements vary considerably but an understanding of this vapor problem makes it possible to design the original installation correctly and thus avoid the high cost of alterations to correct for conditions which could have been anticipated.

Inquiries for more information about the topics already covered in the Seminar or for technical information on other topics in his field, addressed to The Editor, are welcomed and will be forwarded to Mr. Ramsey.

Louis Blendermann on
PLUMBING and PIPING

Water Supply for Laundry Machines

AN abundant supply of clean, cold and hot water is important for laundrettes. Filters and water treatment facilities must be employed, when required, to assure a clean water supply. An adaquate supply of hot water of a prescribed temperature is of equal importance. Water about 140 deg F is suitable for the proper washing of clothes.

Overhead System of Piping

Figure 1 shows a typical arrangement of piping supplied from an overhead system and may be used to furnish water to the laundry machines.

The elevation shows the arrangement of piping in the enclosure. This arrangement indicates that the supplies are dropped from the ceiling into the enclosure and then divide into two sets of horizontal branch lines to furnish water to the laundry machines. Hot water is furnished directly to the laundry machines without the benefit of a hot water circulation line. If, however, the engineer desires to utilize a hot water circulation line, the line would be connected at a point between the last and next to last connection on the hot water branch lines. A circulation pump is then installed on the return line near the hot water generation equipment. The circulating pump assures positive circulation of hot water at a maintained temperature for the laundry machines.

Water hammer arresters are installed at the end of the branch lines, to absorb the shock generated in the branch piping by the quick closing valves in the laundry machines. An alternate location for the water hammer arrestors is at a point on the branch lines near the vertical drop of the piping.

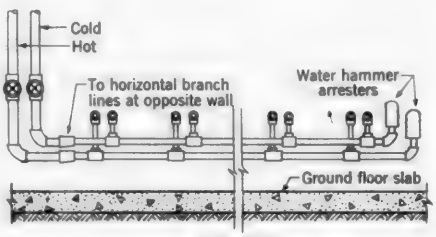
The sections shows how the branch piping is arranged in the enclosure to supply the laundry machines. Although hose bibbs have been indicated for connection to the rubber hoses, other types of connections favored by the engineer may be used with equal success. The horizontal piping branches should be rigidly supported to prevent vibration due to action of the quick closure valves in the laundry machines.

Upfeed System Of Piping

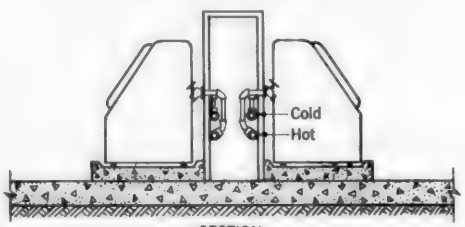
Figure 2 shows an arrangement of piping within the enclosure when piping is supplied from hot water generation equipment located at the floor below the level on which the laundry machines are set.

The elevation shows a water supply arrangement to the laundry machines and shows how the piping may be installed in the enclosure. This arrangement indicates that the supplies are run on the ceiling below and are extended from the hot water generation equipment installed at the lower floor level.

A circulation line is included to insure that the hot water will always be at a prescribed temperature for the laundry machines. Water hammer arrestors are installed either at the top of the cold and hot water risers, as shown, or at the end of the cold and

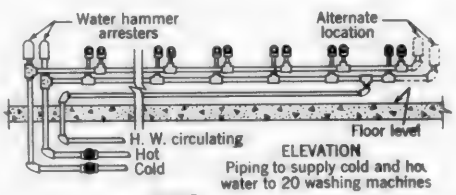


ELEVATION
Piping to supply cold and hot water to 20 washing machines

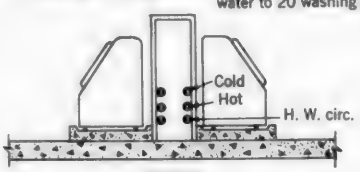


SECTION
Arrangement of horizontal branch piping to serve washing machines

Fig. 1. Arrangement of hot water piping — generator on same floor.



ELEVATION
Piping to supply cold and hot water to 20 washing machines



SECTION
Arrangement of horizontal branch piping to serve washing machines

Fig. 2. Arrangement of hot water piping — generator on floor below.

hot branch water lines, as the alternate location. Two separate sets of branch lines are installed for each set of laundry equipment.

The section shows the particular arrangement of piping in the enclosure. Piping is secured to the inside of the enclosure by any one of several methods that the engineer may choose. Once again, it is important that the horizontal branch lines be rigidly secured to the inside of the enclosure to prevent any piping vibration.

Gas Heaters

Gas heaters are common for application with laundry machines, especially when the layout of laundry machines is not too extensive.

Two gas heaters, Fig. 3, supply hot water to the storage tank. A return line from the storage tank circulates water back to the coils in the gas heaters. The heaters are equipped with automatic controls and switches and will function until a prescribed temperature of water is reached in the storage tank. The tank is equipped with a pressure and temperature relief valve to safeguard the tank from excessive pressures and temperature. When either of these factors occur, the relief line will discharge into a funnel drain provided for this purpose.

The vacuum breaker protects the tank in the event that the water is drained out of the storage tank. When this drainage occurs, the vacuum breaker introduces air into the tank and prevents the storage tank from collapsing.

Hot water for the laundry machines flows from the storage tank and passes through a valve, strainer and check valve and then through a mixing valve which is adjusted to permit water of a prescribed temperature to pass to the laundry machines. Water hammer arrestors are installed as shown, to protect the piping, instruments and equipment against the damage from shocks due to quick closure valves in the piping system. The cold water supplied to the mixing valve for tempering purposes also passes through a valve, strainer and check valve.

When a circulation line is used, it is connected to the storage tank as shown. The cold water supply is connected to the hot water return line. The control switch on top of the vertical return line is adjusted to a prescribed temperature and activates the circulating pump when the water temperature drops. A small diameter bypass line is connected between the return line and the cold water supply to the mixing valve. This measure is a safeguard in the event that the hot port in the mixing valve should close due to excessive temperature in the storage tank. Hot water in the return line will then bypass the storage tank and circulate through the piping system by means of its connection to the cold water supply to mixing valve, as shown.

A vacuum breaker, placed on top of the vertical cold water supply, protects the water distribution system against the danger of hot water being sucked into the cold piping in the event of siphonic action caused by a drop in pressure of the cold water supply. This is an extra protective measure in addition to the check valves included in the piping.

The piping arrangement is only illustrative; the engineer may utilize any method he prefers. When this type of system is properly designed and installed, it will give many years of trouble-free performance and will supply sufficient hot water at the prescribed temperature for the needs of the laundry machines.

Space Heating Plant or Heater

Another method, popular for generating hot water, involves the use of a space heating plant or heater. A typical arrangement is illustrated in Fig. 4.

When a steam or hot water space heating plant is used, submerged coils are placed in the boiler and an indirect external heater is used with the hot water heating plant. Submerged coils are shown in Fig. 4

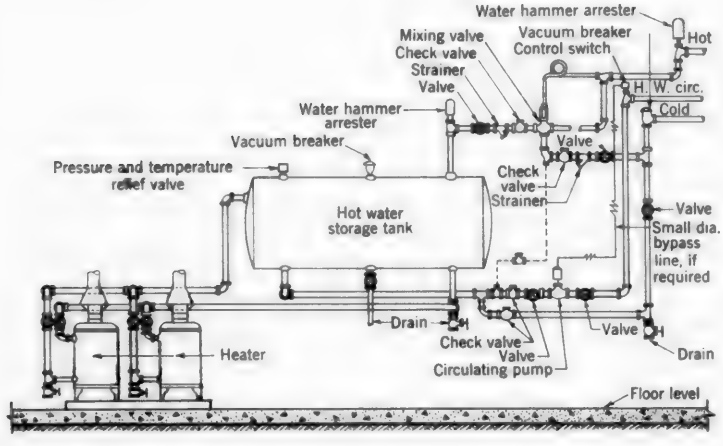


Fig. 3. Piping for two water heaters and storage tank to supply laundry machines. Note vacuum breaker which protects the tank in the event that tank is drained. Air is introduced into tank, preventing its collapse.

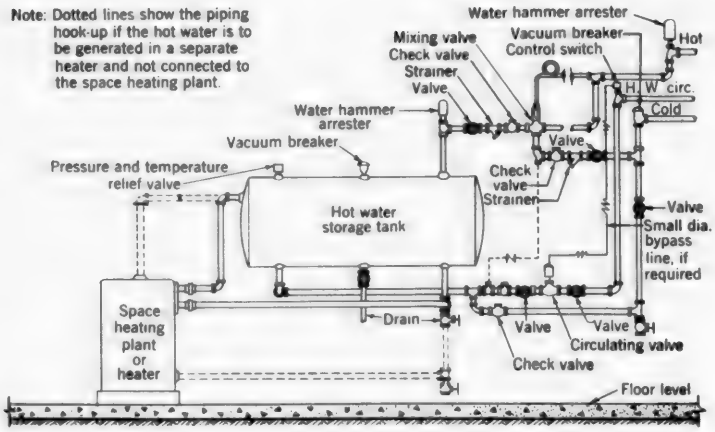


Fig. 4. Typical arrangement of space heating plant used to generate hot water for laundry machines. Return lines circulate water back from storage tank to submerged coils in heater.

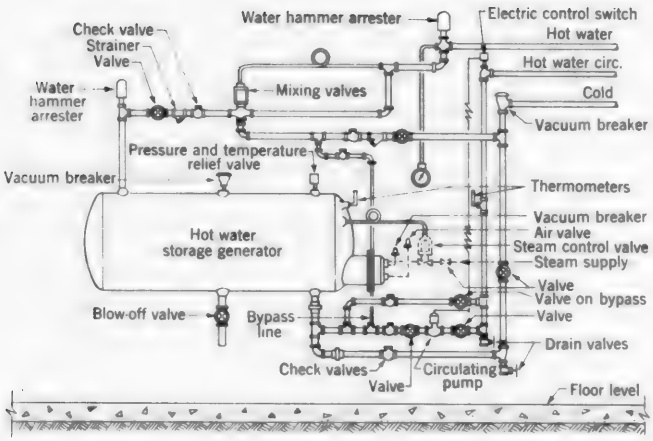


Fig. 5. Hot water storage generator used where steam is available. Heating engineer must be consulted for quantity and pressure of steam.

Hot water is supplied to the storage tank and a return line circulates the water back to the coils. When positive circulation must be provided for the water between the coils and the storage tank, a circulating pump must be installed on the return line from the storage tank. Otherwise, it is important that the storage tank be sufficiently elevated above the coils to assure a good natural gravity circulation of the water.

If a heater is to be used solely for the generation of hot water, the piping connections would be similar to that denoted by the dotted lines shown in Fig. 4. Again, if positive circulation of the water between the heater and the storage tank is desired, a circulating pump must be installed on the return line from the storage tank to the heater. If the circulating pump is not used, the tank should be sufficiently elevated to assure a natural circulation of water between the heater and the storage tank. It is important that the heating engineer be consulted, if he is designing the space heating equipment needs. This coordination will assure an adequate supply of hot water for the needs of the laundry equipment.

The remainder of the piping arrangement of Fig. 4 is more or less the same as that described for the arrangement illustrated in Fig. 3.

Steam Hot Water Storage Generators

When steam is available, a hot water storage generator is a very efficient means for generating hot water. If this method is to be used, the heating engineer should be consulted for the quantity and pressure of steam he can supply to the hot water storage generator. A typical arrangement of piping and equipment for this hot water generating method for laundry machines is shown in Fig. 5.

The piping arrangement is, in general, similar to that illustrated in Fig. 3. The tank is supported on brick or concrete piers or a pipe stand. These have not been shown. The tanks illustrated in Fig. 3, and Fig. 4, can be supported by the same means.

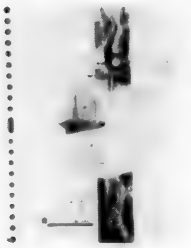
NEW LITERATURE

Use the prepaid yellow postcard in the back of the magazine for securing your copies of these catalogs.

Flush Valves

Information on flush valve selection, specification and installation is published in 60-page Catalog 66 by Coyne & Delany Co., Brooklyn, N. Y. Covering 94 models of Delany flush valves, it includes piping design data and flush valve maintenance hints.

Circle **Item 1** on Inquiry Card



Low-Pressure Boilers

Kewanee Type C boilers for low-pressure heating of commercial and industrial buildings are described in 8-page Bulletin 649B by American-Standard Industrial Division, Detroit, Mich. Building includes ratings, dimensions and full selection data.

Circle **Item 2** on Inquiry Card

Axial-Flow Fans

Axial-flow fans for heating, cooling, ventilating, fume removal and drying systems are described in 16-page Bulletin AFF-61 by L. J. Wing Mfg. Co., Linden, N. J. Construction details, and tables of capacities and dimensions highlight this colorful bulletin.

Circle **Item 3** on Inquiry Card

Automatic Control Valves

An 8-page bulletin describing Selectaflow control valves for hydronic year-round air conditioning units is offered by American-Standard Controls Division, Detroit, Mich. Bulletin 272-A explains operation of these thermostatic selector valves.

Circle **Item 4** on Inquiry Card

Contactors and Starters

Announced by General Electric Co., Schenectady, N. Y., is 8-page Bulletin GEA-7316 describing a complete line of definite purpose contactors and starters for air conditioning and refrigerating. Includes outline drawings, dimensions and wiring diagrams.

Circle **Item 5** on Inquiry Card

Control Centers

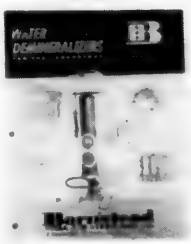
Specific functions, components and benefits of Electronic control centers are discussed in an 8-page brochure offered by Barber-Colman Co., Rockford, Ill. Electric and electronic instruments handle remote temperature indication, recording and control.

Circle **Item 6** on Inquiry Card

Polyethylene Pipe

Polyethylene plastic pipe, designated Supreme by Johns-Manville Corp., New York, N. Y., is described in 10-page Bulletin TR-270A. Included are tables of properties and working pressure, a flow chart, sizes and weights, and complete installation information.

Circle **Item 7** on Inquiry Card



Water Demineralizers

Bulletin No. 154, from Barnstead Still and Sterilizer Co., Boston, Mass., introduces a complete line of disposable cartridge type demineralizers for use in chemical, hospital, electronic, nuclear, laboratory research and pilot plant operations, in models up to 1500 gph.

Circle **Item 8** on Inquiry Card

Cooling Water Problems

Two pieces of technical literature are offered by Associated Laboratories, Inc., Lathrup Village, Mich.: An article on "Cooling and Circulating Water Problems"; and a bulletin, "Suggestions for Maintenance of Water Cooled Air Conditioning Systems."

Circle **Item 9** on Inquiry Card

Grounding Devices

Latest information on National Electric Code requirements most likely to affect the installation and operation of portable electric equipment is available in an 8-page booklet, Grounding Facts, published by The Arrow-Hart & Hegeman Electric Co., Hartford, Conn.

Circle **Item 10** on Inquiry Card

Packaged Boilers

Gas, oil or combination fired packaged boilers, from Ray Burner Co., San Francisco, Calif., are available in capacities from 30 to 300 hp. Company offers an 8-page catalog which contains description, ratings, dimensions, diagrams, and other useful data.

Circle **Item 11** on Inquiry Card

Brick Size Vents

Cast aluminum brick size vents are available from Construction Specialties, Inc., Cranford, N. J., in an expanded line of 18 modular sizes, both fixed and operating. C/S vents, called the ideal answer to air intake or exhaust, are described in a 4-page bulletin.

Circle **Item 12** on Inquiry Card

Use the prepaid yellow postcard in the back of the magazine for securing your copies of these catalogs.

Dry-Type Air Filter

An 8-page bulletin describing its high-efficiency DRI-Pak dry-type unit air filter is announced by American Air Filter Co., Inc., Louisville, Ky. Bulletin No. 228 describes applications, construction, installation and operation, and includes performance data.

Circle **Item 13** on Inquiry Card

Centrifugal Roof Ventilator

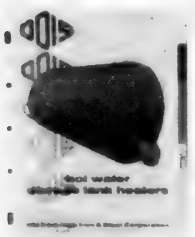
An 8-page bulletin (No. 4104) describing the Model CRD direct-drive centrifugal roof ventilator is available from American-Standard Industrial Division, Detroit, Mich. Bulletin includes design features, operating characteristics, and selection and rating tables.

Circle **Item 14** on Inquiry Card

Oil Field Piping

Two bulletins on its Delrin acetal resin pipe are available from the Du Pont Co., Wilmington, Del. Four-page Bulletin A-14789 describes the pipe and its oil field applications, and 8-page Bulletin A-15993 is an installation manual for this thermoplastic pipe.

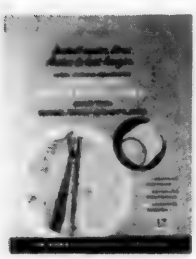
Circle **Item 15** on Inquiry Card



Storage Tank Heaters

Catalog No. 602, published by Old Dominion Iron & Steel Corp., Richmond, Va., describes complete line of ODIS hot water storage tank heaters. Sixteen-page bulletin lists range of lining materials and heating elements, and includes application data and diagrams.

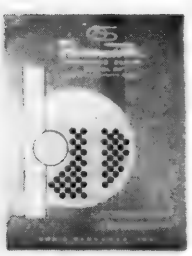
Circle **Item 16** on Inquiry Card



Asbestos-Cement Pressure Pipe

An 8-page brochure, TR-160A, announced by Johns-Manville Corp., New York, N. Y., lists advantages of and describes Transite asbestos-cement pressure pipe for use in water mains. Pipe sizes and weights are tabulated, and installation techniques are outlined.

Circle **Item 17** on Inquiry Card



Packaged Automatic Boiler

Announced by Orr & Sembower, Inc., Reading, Pa., is 4-page Bulletin No. 1275 which illustrates and describes the Powermaster Positive Flow boiler. This packaged automatic unit has a side-located furnace and counterflow heat transfer. Ratings are included.

Circle **Item 18** on Inquiry Card

Classroom Conditioning

Application of electric heating to its Comfort Curtain system for classrooms is subject of bulletin published by Lennox Industries, Inc., Marshalltown, Iowa. Schemes include resistance heating with or without mechanical cooling, and heat pump year-round use.

Circle **Item 19** on Inquiry Card

Fired Immersion Heaters

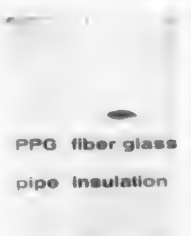
Brown Fintube Co., Elyria, Ohio, offers 4-page Bulletin 410 telling of its new line of fired immersion heaters, designed for heating asphalt, Bunker C oil, etc., in tanks for loading, pumping, blending or storage. Specifications and dimensions are included.

Circle **Item 20** on Inquiry Card

Plastic-Coated Steel Pipe

The performance of Republic X-Tru-Coat is heralded in this 8-page booklet, designated Adv. 1218 and available from Republic Steel Corp., Cleveland, Ohio. A high-density polyethylene coating over steel pipe adds corrosion protection to strength, for long life.

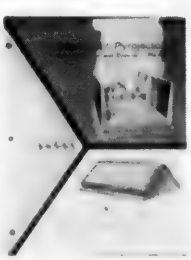
Circle **Item 21** on Inquiry Card



Fiber Glass Pipe Insulation

A specification folder on its fiber glass pipe insulation is announced by Fiber Glass Div., Pittsburgh Plate Glass Co., Pittsburgh, Pa. Four-page folder includes dimensional standards, packaging data, recommended finishes, and recommended thicknesses.

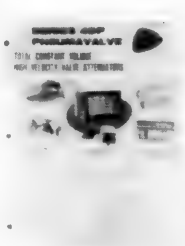
Circle **Item 22** on Inquiry Card



Emergency Relief Units

The Swartwout Pyrojector, an automatic fire and explosion relief unit, is described in 4-page Bulletin PJ2. Published by Swartwout Fabricators, Inc., Kokomo, Ind., it also covers the Sky-Lite Pyrojector, a combination skylight and emergency relief unit.

Circle **Item 23** on Inquiry Card



Valve Attenuators

Offered by Connor Engineering Corp., Danbury, Conn., 4-page Bulletin K-52 describes Series 45P Pneumavalve total constant volume, high velocity valve attenuators, which need neither motors nor mechanical linkage. Performance data are included.

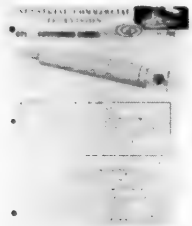
Circle **Item 24** on Inquiry Card

Use the prepaid yellow postcard in the back of the magazine for securing your copies of these catalogs.

Coal Conveyor

An economical, self-clearing coal conveyor is the subject of a 4-page bulletin (W-316) offered by The Will-Burt Co., Orrville, Ohio. Bulletin includes photos, diagrams and specifications for this unit which is suitable for any bin-to-stoker arrangement.

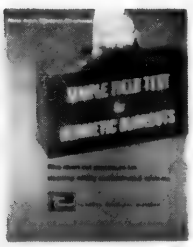
Circle **Item 25** on Inquiry Card



Pipe-Viewing Camera

A 2-page catalog sheet illustrates, explains, and give detailed specifications for a closed-circuit television camera designed to explore pipes as small as 4 inches in diameter. Camera was developed by GPL Div., General Precision, Inc., Pleasantville, N. Y.

Circle **Item 26** on Inquiry Card



Field Test for Hermetic Burnouts

Available from General Chemical Div., Allied Chemical Corp., New York, N. Y., is a 12-page report on its recently announced simple field test for hermetic motor burnouts and the short-cut procedure for cleaning mildly contaminated refrigeration systems.

Circle **Item 27** on Inquiry Card

Drills and Fasteners

Twelve new products are announced in a 36-page catalog offered by Holub Industries, Inc., Sycamore, Ill. Catalog No. 101, however, includes specifications and descriptive data on the company's full line of wiring devices, fastening devices and masonry drills.

Circle **Item 28** on Inquiry Card

Commercial Conditioners

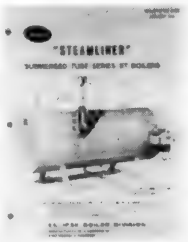
Airtemp Div., Chrysler Corp., Dayton, Ohio, offers 6-page Form LL-482 listing its lines of air-cooled and water-cooled air conditioning equipment. Specifications are given for all the company's commercial conditioners, ranging from 40,000 to 420,000 Btuh.

Circle **Item 29** on Inquiry Card

Draft Inducer

Mechanical draft inducers for domestic and industrial heating plants are described in literature which is offered by The Quickdraft Corp., Canton, Ohio. Illustrated material includes sections on construction, specifications, selection and installation.

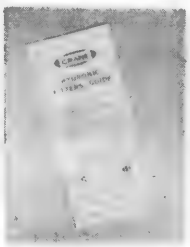
Circle **Item 30** on Inquiry Card



Side-Fired Boilers

A side-fired packaged boiler line said to provide up to 20% more usable floor space than end-fired models is described in 4-page Bulletin No. A-103 by Eclipse Boiler Div., Eclipse Fuel Engineering Co., Chattanooga, Tenn. Capacities, dimensions are listed.

Circle **Item 31** on Inquiry Card



Hydronic Fitters' Guide

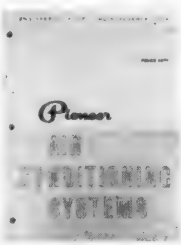
A new edition of the Hydronic Fitters' Guide is available from Plumbing-Heating-Air Conditioning Group, Crane Co., Johnstown, Pa. Based on I-B-R guides and manuals, the folder includes data on determining heat loss, sizing boiler, and selecting radiation.

Circle **Item 32** on Inquiry Card

Air Control Products

American Warming & Ventilating Co., Toledo, Ohio, offers its 1961 catalog of extruded and fabricated air control products. These include louvers (architectural, weather, door and sun), shutters (wall and ceiling), dampers, and roof ventilators and penthouses.

Circle **Item 33** on Inquiry Card



Air Conditioning Systems

Engineering facts and reference data are contained in a 52-page manual, Pioneer Air Conditioning Systems, available from Pioneer Manufacturing Co., Los Angeles, Calif. Data include heat loss, equipment sizing, perimeter systems, ducts and diffusers, insulation.

Circle **Item 34** on Inquiry Card

Humidity Instruments

Precision instruments for the measurement and control of relative humidity are manufactured by Hygrodynamics, Inc., Silver Spring, Md. A well-illustrated, 72-page catalog describes typical and tailored hygrometer systems utilizing these instruments.

Circle **Item 35** on Inquiry Card

Gas-Hydronic Heating Systems

A specification and product data binder covers gas-hydronic heating systems and components. Indexed sections include boilers, volume hot water heating, installation, accessories and general data. Company suggests that you send letterhead request for binder to Hydrotherm, Inc., Dept. AC-1, Northvale, N. J.

Air Conditioning a Y-Shaped Courthouse

GENE GADDIS

Senior Application Engineer, Commercial Div.
Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.

BOTH ARCHITECTURAL AND FUNCTIONAL considerations dictated the striking Y-shaped design of the new million-dollar Dunn county courthouse in Menomonie, Wisconsin. The unusual interior layout improves traffic flow and allows ample parking near the most-used facilities. Yet despite its apparent complexity, the Y design kept construction cost ($18.24 per sq ft) comparable to a conventional building. Air conditioning operating costs are substantially less since only comparatively small wall areas face the direct sun or the prevailing north winter winds.

The floor plan follows the traffic pattern to the offices. Most-visited areas of the courthouse (county treasurer, clerk, registrar and courtrooms) are on the first floor. Departments which normally have fewer visitors (welfare, county services and school superintendent) are on the second floor, while offices with the least public traffic—county highway department, historical society, probation office and selective service—are on the top floor. The ground floor includes federal offices, an auditorium, lunchroom and mechanical equipment room.

The three branches of the Y radiate from a central core area, which contains a lobby, elevator shaft and air-conditioning ducts. The three main entrances on the first floor open directly into this lobby. In addition, there are entrances at the end of each wing.

The two-story trunk of the Y faces south. To cut construction costs the courtrooms, which required high ceilings, were located here. The six-sided courtrooms are shaped to fit in this area, leaving rooms for the jury, court reporter, library and judges' chambers.

The three-story wings of the Y, which extend northeast and northwest from the central core, comprise perimeter offices along the north exterior walls on each floor, next a series of windowless interior offices, then a corridor along the south wall.

Air Conditioning System

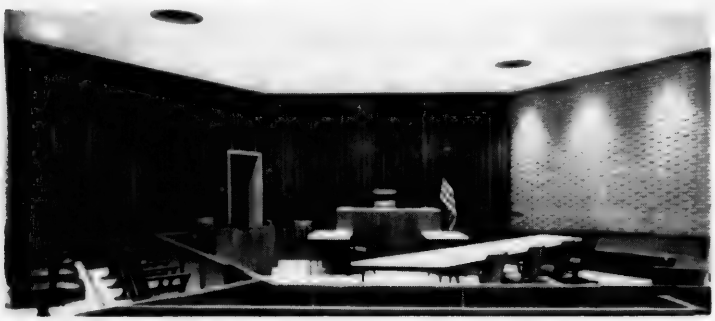
The air conditioning systems were designed to take advantage of the unusual building design. Because the wings are angled, they receive less solar heat during summer and have less exposure to the prevailing north wind during winter. The trunk area, which has walls facing east, south and west, has only a few windows, reducing air conditioning costs.

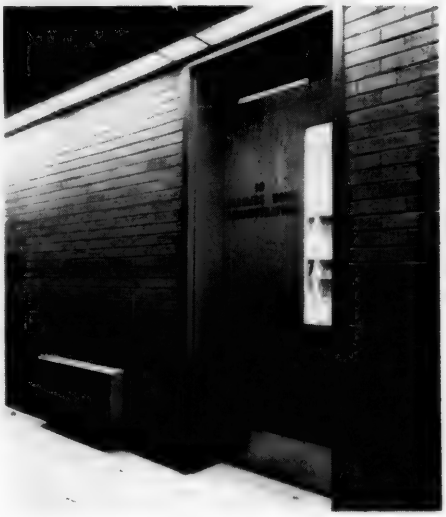
The building has two basic air conditioning systems: a multizone system ventilating the entire building, supplemented by fan-coil units in the perimeter office areas for individual temperature control.

Ventilating Systems

The two wings and the trunk areas are supplied with 100% outdoor air by two separate systems—one for the wings and one for the trunk. The air is fed into the areas through overhead diffusers.

Both ventilating systems feature automatic summer winter changeover, regulated by Honeywell thermostats on the exterior north wall. Three-way valves plus face and bypass dampers hold system temperature at 65 deg F winter and summer. The wings are supplied air by a 4800 cfm fan; the trunk





(Top) Circuit courtroom walls are brown brick and walnut. Supply and exhaust grilles are screened by vertical wooden louvers which blend into walls. (Right) Corridor doors have slots cut in transom to let air move from interior office areas into corridor and then to exhaust ducts in building core. Note convection unit for supplemental corridor heat.

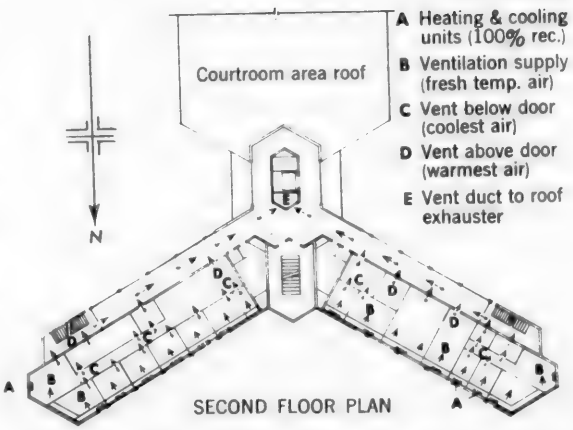
area has a 3250 cfm fan. Hot and cold water are circulated through the system by 53 gpm pumps in the wings; for the trunk 36 gpm pumps are used.

In the wings this ventilating air is supplied to the perimeter office areas only. To move this air into the windowless interior offices (which have no supply ducts) doors between perimeter and interior offices in each suite are undercut, allowing cool air to move into the interior offices.

Warm air from the interior offices passes out through a slot in the transom into the corridor, then to exhaust ducts in the building core. While air passes through the slot, virtually no noise does.

Though the building is not under pressure, there is a gentle air movement through the building from the supply system to the exhaust ducts. The air movement, however, is not enough to cause any noticeable drafts.

Convection units in the corridors supply additional heat in winter. In the summer solar heat gain is minimized by small windows which can be screened by vertical blinds.


A Heating & cooling units (100% rec.)
B Ventilation supply (fresh temp. air)
C Vent below door (coolest air)
D Vent above door (warmest air)
E Vent duct to roof exhauster
Courtroom area roof
N
SECOND FLOOR PLAN

Plan view of courthouse's second floor shows flow paths of ventilating and conditioning air supplies.

Fan-Coil Units

While the ventilating system supplies air at a constant 65 deg, many offices will want warmer temperatures in winter and cooler in summer. Therefore, perimeter areas throughout the courthouse have fan-coil units with individual temperature control. These units have no separate air supply; instead they recirculate room air.

In winter the units are supplied 120-deg water; in summer the water is chilled to 47 deg. The amount of water, and therefore the room temperature, is controlled by a Honeywell thermostat mounted in each fan-coil unit; a three-speed fan regulates air velocity.

Depending on location, the fan-coil units are supplied by three separate systems—northeast and northwest wings, and the trunk. Like the ventilating system, these separate systems automatically change from summer to winter operation as the outdoor temperature falls, automatically change back when the temperature rises. Any system can change over without affecting the others.

As the temperature rises, a three-way valve closes off the hot-water supply to the system. The water recirculates through that system until water temperature falls to 80 deg; then the cold-water supply valve opens, supplying chilled water to the units. The northwest system is fed by a 49-gpm pump; the northeast by a 46.5 gpm pump; and the trunk, a 41-gpm pump.

For all ventilating and fan-coil units, hot water is supplied by a 75-hp oil-fired boiler. To wring maximum heat from the boiler it is fitted with an automatic damper to close off the stack when the burner is off, creating a "thermos bottle" effect. An interlock prevents the furnace firing until the damper is completely open.

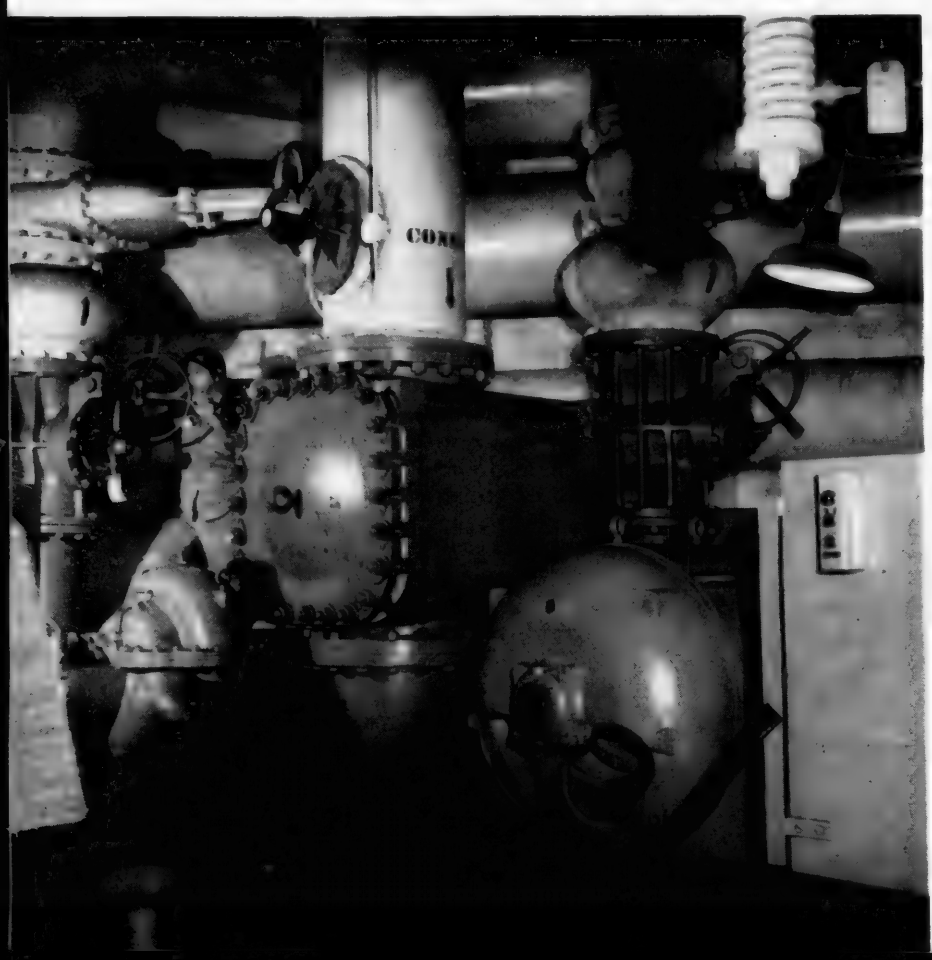
A. H. Kaulfuss was the mechanical engineer on the project; architects were Carl W. Schubert and Associates, Inc., LaCrosse, Wis.; and Eckert and Carlson, Winona, Minn.

Garden State Plaza buildings constitute largest regional shopping center in the country, will expand further in 1963. Center occupies 100 of 140 acres at junction of New Jersey's routes 4 and 17. Stores range from corner drug store size to 340,000 sq ft for Bamberger's Department Store.

Control Heating and Cooling With Lubricated Plug Valves In Mammoth Shopping Center

Lubricated plug valves have the advantage of being able to perform both throttling and shut-off functions, valves. Here is a description of how they were applied a task usually requiring a combination of globe and gate on hot and chilled water lines to control a unique heating and air conditioning system.

Main part of air conditioning equipment shows size of system. Pumps move water to condenser. Rockwell-Nordstrom lubricated plug valves, such as the one being opened below, are used throughout the system to regulate temperature and water flow.



A CENTRAL PLANT beneath the Garden State Plaza shopping center provides heating and air conditioning for the country's largest shopping center in Paramus, New Jersey. One 200-hp and four 800-hp boilers produce 127,000 lb steam per hr at 165 deg F which is fed to cascade heat exchanges to produce high temperature water. Through a 10-inch main and individual run-offs, from ½ inch to 6 inches dia, HTW is pumped directly to tenants of the center.

One of the largest of its kind, the system is thought to be the first that delivers HTW to retail stores. Tenants, such as restaurants and cleaners who need steam, generate their own in individual HTW-steam exchangers.

Two 2250 F-12 centrifugals generate chilled water which is pumped to the tenants' air handling units through lines that range from ¾ to 20 inches dia. Several hundred lubricated plug valves, manufactured by Rockwell Manufacturing Company, are used on the individual hot and cold take-off lines at the stores. Positive shut-off; easy, quarter-turn, open-close action; low pressure drop and throttling ability of the valves are said to suit them for many applications in the heating and cooling system, however.

At the shopping center, primary use of the lubricated plug valve is at the store take-off, where it does the work of a gate and globe valve

combination. During installation, tenant flow requirement is established and the valves set to provide the correct flow of hot and chilled water. The positions are marked on the valve for reference. When closed, the valve provides positive shut-off. When opened to the marked position, it throttles incoming water to assure adequate flow.

Elsewhere in the system, the lubricated plug valve is used on the discharge of hot water pumps, on the chilled and condenser water lines of the refrigeration system, and on the 16- and 18-inch condenser water pump discharge lines.

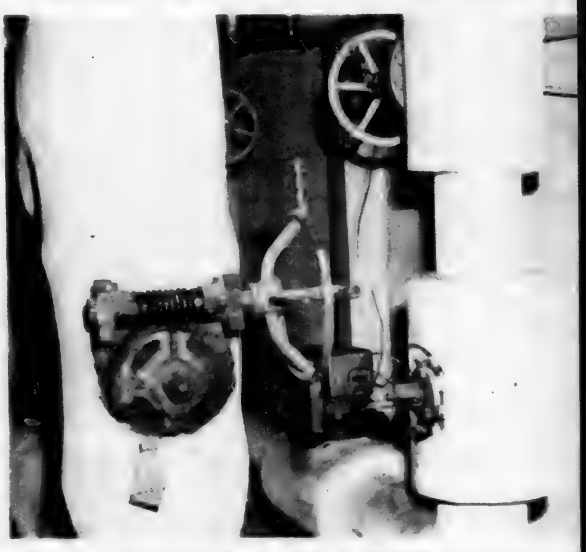
Made of cast carbon steel or semi-steel, the lubricated plug valve has only five parts: body, tapered plug, cover, resilient member, and lubricant packing. *The lubricant must be considered as a component of the valve for proper understanding of its design and functioning.*

The tapered plug is the only moving part. It is the rotating member, with full 90° travel from open to close. Manufactured to close tolerances, it is lapped for precision fit with the body. The body provides a housing and seating surface for the plug, as well as flanges for connection of piping. The cover, bolted to the top of the body, keeps the plug in place.

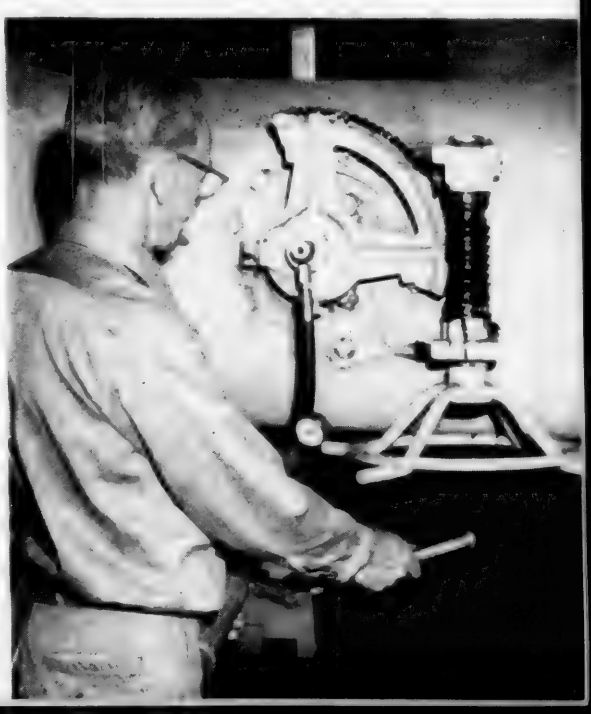
If the plug sticks or is hard to turn, the valve probably needs lubrication. Then, a few turns of the lubricant screw pressurizes the lubricant, builds a large hydraulic force between the smaller tapered end of the plug and the valve body, unseats the plug, and allows it to turn freely.

When the plug is unseated, the small annular clearance between plug and body is filled with pressurized lubricant which acts as a renewed seat plus lubricating medium to assure smooth turning action. This, it is said, virtually eliminates the chance of seizing or galling, making it unnecessary to resort to large wrenches or "cheaters" to run the valve.

Eight-inch main lines carry HTW (350 deg F) to tenants. Note disparity in size between plug valve, near top, and conventional valve above it (only partly shown). Engineer checks meter for flow reading.



Plug valves on hot and chilled water lines to Bamberger's Department Store. Direct-reading Btu meters on each line enables billing only for energy actually consumed.



Greasing plug valve, required when valve becomes hard to turn, is simple. Lubricant screw is tightened, pressurized lubricant unseats valve momentarily, fresh lubricant moves in.

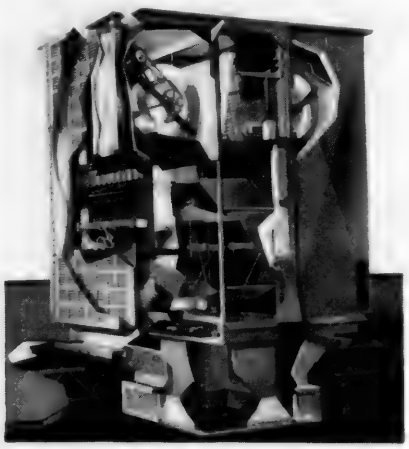
NEWS OF EQUIPMENT AND MATERIALS

Use the convenient prepaid yellow postcard in the back of the magazine for securing more information about new equipment and materials described in this department.

Roof-Mounted Conditioner

Comfort for shoppers, draft-free working conditions for checking personnel, and protection for frozen foods in open bin dispensers—these were some of the objectives sought by Lennox Industries Inc., Marshalltown, Iowa, in designing a new roof-mounted heating, ventilating and air conditioning unit for retail stores. The increasing value of floor space in such establishments dictates indoor comfort equipment which will not occupy any floor space, according to the firm.

Also well-suited to clinics and office buildings, the roof-top unit combines two of the company's Landmark units into one flexible package which delivers either 7½ or 10 tons of cooling, combined with heating capacity from 204,000 (in increments of 34,000 Btuh) up to 340,000 Btuh. Temperatures in any



season may be controlled by a single heating-cooling thermostat or, at the owner's option, by two thermostats each controlling a separate zone.

As dictated by the requirements of the occupied space, the conditioned air may be ducted or it may be distributed through a specially designed diffusing head which projects well below the ceiling surface. Through the use of separately adjustable combination horizontal-vertical louver blades, the conditioned air may be directed exactly as needed with a virtual elimination of ceiling smudging. Combination duct and diffuser delivery is also available.

Return air, as required, enters the center of the diffusing head into a special damper chamber where motorized dampers are regulated by a mixed-air temperature controller which directs a modulating damper motor. The motor positions both the outside air and exhaust air dampers to allow more exhaust as more outside air (up to 100%) is brought in.

More Information? Circle Item 36 on Inquiry Card.

Accessories for Air Handlers

Halstead & Mitchell Co., Pittsburgh, Pa., is offering a complete line of accessories for use with its floor-mounted and horizontal types of air handlers. The 16-model line for centralized conditioning is available in capacities ranging from 880 to 47,500 cfm.

Filter sections for high or low velocity are available for all H&M air handlers. Cleanable or throwaway filters may be used with either type section.

Face and bypass dampers and mixing boxes, with or without dampers, also may be added to the units. The former is used to provide desired leaving air conditions, the latter to control proportioning of ventilation and return air.

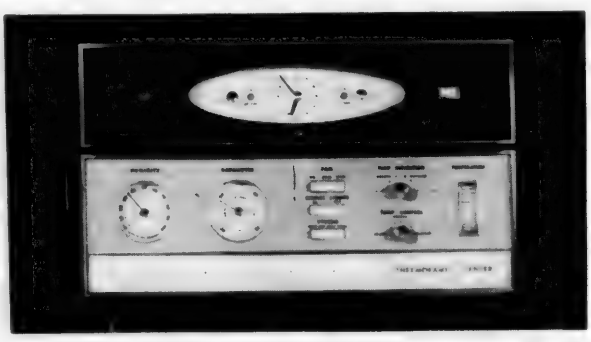
Directional discharge, either vertical or horizontal, may be specified on all floor mounted or horizontal models.

More Information? Circle Item 37 on Inquiry Card.

Weather Data, Control Center

General Controls Co., Glendale, Calif., has unveiled its Thermoramic Center which offers indoor weather data and control, as well as information on outdoor atmospheric conditions.

Measuring 8 by 14 inches, the weather control panel serves as a sentinel for external barometric and humidity conditions, plus automatic sequencing of day and night indoor temperatures. Another feature is a monitor system which indicates clogged



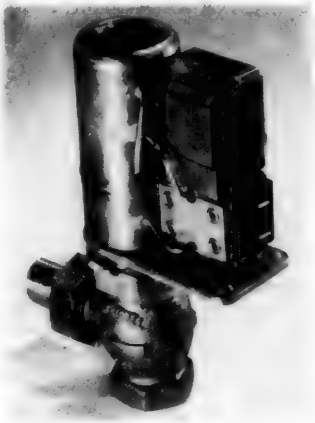
air conditioning filters, an extinguished gas pilot light, an improperly functioning compressor or the need to reset an oil burner.

The company points out that the Thermoramic Center enables homeowners to anticipate the weather in order to dress properly and plan the day's activities. It also saves steps since all indoor comfort is controlled from one compact, centrally located panel, and reduces service calls since the warning system pinpoints trouble specifically and instantaneously.

More Information? Circle Item 38 on Inquiry Card.

Fluid-Power Control Valve

A new electric control valve based on an unusual operating principle is introduced by Commercial Div., Minneapolis - Honeywell Regulator Co., Minneapolis, Minn. It is called the "fluid-power" valve and uses an electromagnetic "pump" to move liquid metal in order to control fan-coil units, convectors and radiators.



With only three moving parts—valve stem, power bellows and the liquid metal—the valve has liquid smoothness, silence, speed, compactness and exceptionally long life, the firm discloses.

Components of the actuator include a field coil, transformer, electromagnetic pump, reservoir bellows and power bellows. The transformer supplies high current—up to 180 amperes—at a reduced voltage of 30 or 40 millivolts to two electrodes. The field coil supplies a magnetic field between two pole pieces. The power bellows is linked to a conventional valve stem which seals against a disc in the cast body.

Key to the actuator's operation is the electromagnetic pump, which actually is a small slit between the electrodes and pole pieces. This small slit connects passages leading to the reservoir bellows and the power bellows.

Current flows through the field winding and transformer primary, inducing both a current and a flux in the liquid metal in the slit. The resultant force pushes the liquid metal through the slit to the power bellows at pressures up to 50 psi.

The power bellows forces the valve stem down, closing the valve. When the current is turned off, a return spring pushes the valve stem and power bellows back to the original position, and the liquid metal flows from the power bellows through the slit back into the reservoir bellows.

Although alternating current reverses itself 120 times a second, the flux simultaneously reverses, so the resulting motion of the liquid metal continues in the same direction.

More Information? Circle Item 39 on Inquiry Card.

Adds Conditioners, Heat Pumps

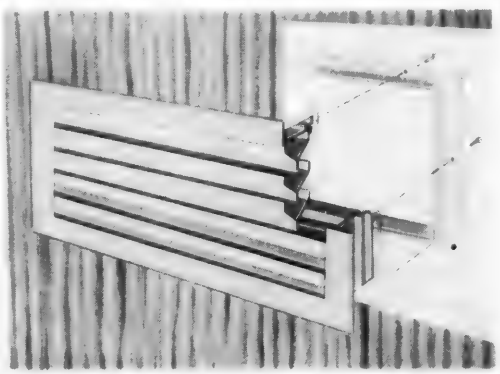
Central Air Conditioning Dept., General Electric Co., Tyler, Tex., announces four new units in the 8 to 10 ton range to broaden its coverage of the commercial and industrial air conditioning and heat pump markets. Designated as the TA96A and TA120A (8 and 10 ton straight cooling) and WTA96A and WTA120A (8 and 10 ton heat pumps), these models have been engineered from the ground up, the company states, to provide long, trouble-free service under the demanding conditions encountered in commercial and industrial installations.

More Information? Circle Item 40 on Inquiry Card.

Door Louvers

Construction Specialties, Inc., Cranford, N. J., through the addition of three new special purpose louvers, now offers its C/S extruded aluminum door louvers in a complete line for all situations. To standard and sightproof models have been added a lightproof louver, a soundproof louver and an operating unit.

The operating door louver, in 16 gage aluminum, fits the particular needs of hotels, motels, hospitals and office buildings. It provides a high free area in open position and is designed with all blades center-pivoted to adjust from fully-open to fully-closed position with the flick of a finger. An automatic fusible link mechanism to close the blades in case of fire is available on specification.



The sound absorbing door louver is treated with an acoustical barrier bonded to the underside of a sightproof blade. This sound damping barrier effectively reduces transmitted sound, providing a quietness that in offices, as an example, adds materially to worker efficiency and substantially lessens worker fatigue.

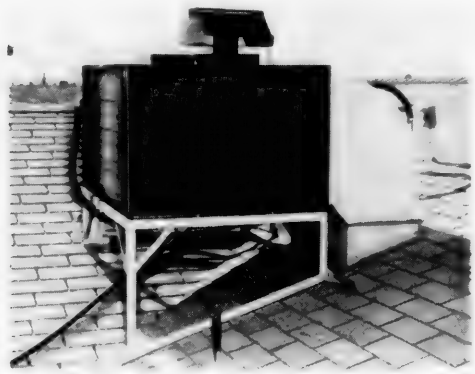
The lightproof door louver gives protection against extraneous light leakage into photographic darkrooms, optic laboratories, and optical examining rooms, yet permits free air passage to prevent accumulations of stale or unpleasant air. It has opposed-channel extruded blades and is furnished in a dull black painted finish for minimum light reflection. All C/S door louvers are available in a wide range of sizes and free areas.

More Information? Circle Item 41 on Inquiry Card.

Outdoor, Year-Round Conditioner

A year-round air conditioning unit, designed for outdoor installation in residential and small commercial applications, is announced by The Payne Co., La Puente, Calif.

The Econoair is a combination of a horizontal type, forced-air gas furnace and an air-cooled, electric remote air conditioner, all in a single, compact, weatherproof cabinet whose size is much the same as that of a remote compressor for an air conditioner or heat pump.



It was designed to offer the advantage of a unified year-round system for outside installation, with full capacity for both heating and cooling in virtually all geographic locations. The heating side of the unit is a full-size furnace in 55,000, 80,000, and 100,000 Btuh models.

Outside installations of the conditioner can be either slab-mounted on the ground level or rooftop mounted, as illustrated.

Ground-level installations are on slabs close to the side wall of the house. Supply and return air duct connections are made through the wall to the underfloor duct sytem in a crawlspace or basement—or with risers to an attic system.

For rooftop mounting on other than flat roofs, a simple angle-iron framework which forms a shelf is recommended by the manufacturer. Weight load is no problem on most roofs since it will be distributed across several rafters. The silhouette is low enough that an installation on a rear slope will normally be unseen from the front. On very flat slopes, the unit can be recessed, like a dormer window.

More Information? Circle Item 42 on Inquiry Card.

Air Cooled Condensing Units

Airtemp Div., Chrysler Corp., Dayton, Ohio, has introduced a pair of high capacity air cooled condensing units for split system installations: 10-hp Model 1212 and 15-hp Model 1216.

Model 1212 has a 114,000 Btuh capacity when used with the company's 1412 cooling coil, which delivers 4,000 cfm. If zone control is desired the 1212 condensing unit can be matched with two 1408-03 cooling coils, or other Chrysler coils.

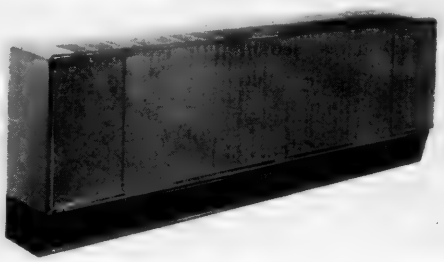
Model 1216 condensing unit can be matched with the 1416 cooling coil, which results in 154,000 Btuh and 6,000 cfm, respectively. Paired with two 1489 cooling coils, the 1216 delivers 166,000 Btuh.

More Information? Circle Item 43 on Inquiry Card.

Classroom Comfort System

A new concept in providing positive regulation of comfort for low budget school classrooms is announced by Modine Manufacturing Co., Racine, Wis.

This development, called the School-Vent, is said to utilize a method which promises far-reaching economies coupled with high quality performance. Unlike existing units which resort to modulating control valves to regulate steam or hot water, the Modine system controls the air—not the water. This is reported to provide more positive, constant, and pinpoint room temperature control, and is accomplished through a unique full-damper system.



Included in the system are:

1. A face-and-bypass insulated damper which directs air through and around the heating coil according to comfort requirements;

2. An insulated anti-wipe damper which permits complete isolation of the coil, eliminating heat pick-up from the coil;

3. Indoor and outdoor dampers which assure proper blend of fresh and recirculated air at all times.

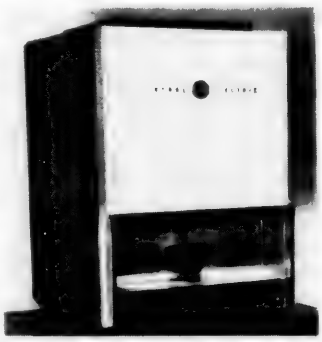
This full-damper system insures more accurate temperature control than is currently possible, the company reports, with no delay between comfort demand and comfort delivery. The system is constantly alert to changes in classroom temperature and fresh-air requirements, adjusting automatically to maintain pinpoint comfort levels.

System heats with steam or hot water and cools with central-source chilled water. Five sizes up to 1500 cfm heating and cooling are available. If necessary, cooling can be added later. Unit can be ceiling or wall mounted, partially and fully recessed, or fully exposed.

More Information? Circle Item 44 on Inquiry Card.

Thermoelectric Water Cooler

The first application of the thermoelectric principle to its water coolers is announced by Commercial Equipment Dept., General Electric Co., Chicago Heights, Ill.



Thermoelectric cooler is reported to eliminate the need for compressor and a refrigerant, normal requirements in conventional coolers. Water is cooled electrically, and the temperature is regulated by varying the amount of current flow to the thermoelectric elements.

G-E emphasized that the new cooler does not replace its standard line of water coolers, and stated that production plans for the new unit would depend upon market test results.

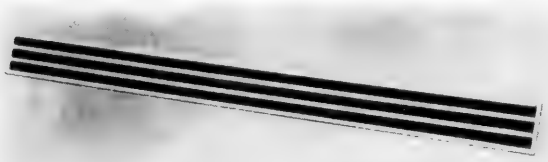
The cooler, about 15 inches square and 21 inches high, is expected to find application in executive-type offices and other facilities serving up to three people. Top of the cooler is shaped so that a bottle of water can be used for supply, or the tank itself may be filled with water. The cooler is noiseless in operation, requires little maintenance and its lack of moving parts is expected to result in longer life.

More Information? Circle Item 45 on Inquiry Card.

Straight Line Diffusers

According to Anemostat Corp. of America, New York, N. Y., its ASL architectural straight line air diffuser combines superior air diffusion characteristics with the esthetic appearance of a slender unit with symmetrical vanes.

The trend to high light densities and large outside glass areas in modern building design has raised the cooling load in both interior and exterior zones. This line of diffusers has been designed to solve this problem economically by permitting the use of high cooling temperature differentials.



Diffusers are well-suited for continuous wall-to-wall application, or they can be used as individual diffusers. The ASL units are easy to install; no screws, nuts or bolts are needed.

More Information? Circle Item 46 on Inquiry Card.

Prevents Rapid Compressor Cycling

A new control circuit which prevents rapid cycling of compressors is announced by Carrier Air Conditioning Co., Syracuse, N. Y. Called Time Guard, the control is now being installed on all residential cooling equipment up to three tons of capacity and on the 10-ton heat pump.

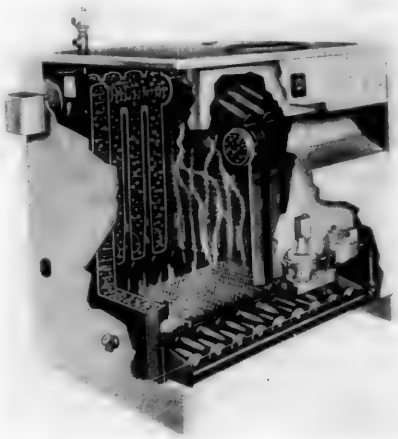
Designed to reduce nuisance calls to dealers and prolong compressor life, the timer starts the condenser fan motor 15 seconds before the compressor starts. This removes residual heat from the condenser and reduces head pressure during start-up. When the compressor stops for any reason, the timer prevents its restarting for five minutes.

More Information? Circle Item 47 on Inquiry Card.

Boiler Incorporates Air Eliminator

A new gas boiler, designed for installation in larger residences and small apartment and commercial buildings, is announced by American-Standard Plumbing & Heating Div., New York, N. Y. Called the G-40, the boiler is styled with a deluxe grey jacket and is reported ideal for the new construction and replacement market for both hot water and steam installations.

Boiler includes the built-in air eliminator known as the Eliminaire, recently introduced by American-Standard. This air eliminator does away with the cost and time of installing external apparatus to separate water and air. With the G-40, a separate



water heater is no longer required since the boiler has a tankless water heater suitable for steam or water installations.

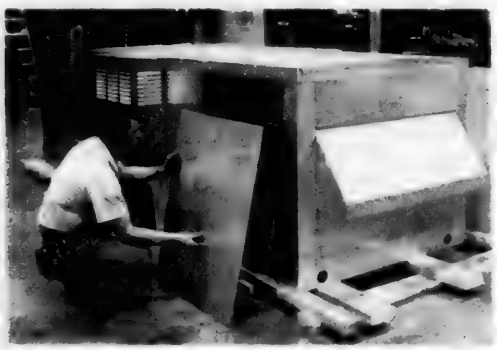
The greater Btuh input per burner results in fewer sections, cutting down installation time and space requirements. Also, since up to six sections can be ordered pre-assembled, with or without the tankless heater installed, on-site assembling time can be cut.

More Information? Circle Item 48 on Inquiry Card.

Roof-Top Heating-Cooling Unit

A new 7½-hp heating and cooling roof-top unit (Model CRU-801) is available from Air Conditioning Div., Westinghouse Electric Corp., Staunton, Va. The combination unit is reported to be ideally suited for both commercial and industrial installations. Total cooling capacity of the unit is 75,900 Btuh; the total output of the gas furnace is 160,000 Btuh.

To facilitate handling, shipping, and adaptability to various types of installations, the unit is divided into two separate sections: one for heating and the other for cooling. The heating section consists of two fans on a common shaft, a one-hp fan motor and variable pitch drive, filters, and two 100,000 Btuh input duct-type furnaces; an air-cooled condensing unit, evaporator coil, and control box comprise the cooling section.



Unit is designed for easy connection installation, since supply and return air enter through a single ceiling diffuser. Alternate external supply and return duct connections may be made if required. The unit includes a complete aluminum casing over the air handling section and includes special channel joints designed to prevent leakage.

More Information? Circle Item 49 on Inquiry Card.

Storage Heater Lining

The Patterson-Kelley Co., Inc., East Stroudsburg, Pa., announces a five-year guarantee on all factory-installed Pre-Krete linings used in storage water heaters.

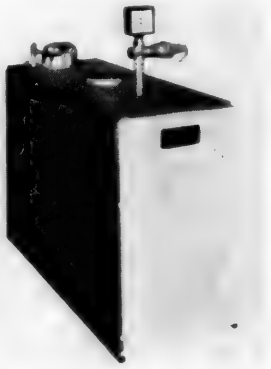
Unconditional "un-prorated" guarantee is called the first of its kind in the water heater industry and includes free replacement and all materials and labor. Guarantee applies to all Pre-Krete factory-lined P-K storage water heaters, including the Scalefree 230 gas-fired water heater.

The ¾-inch hydraulic cement coating, which will not chip, crack or flake at temperatures exceeding 880 deg F, the company reports, is a precision blend of homogeneous materials which protect the entire inner surface of the water heater.

More Information? Circle Item 50 on Inquiry Card.

Swimming Pool Heating System

Hydrotherm, Inc., Northvale, N. J., announces its new Pleasur-Temp pool heating system. In addition to heating swimming pools, the system may be used to supply hot water for showers and vapor-steam for private steam rooms, an increasingly popular feature in modern residences.



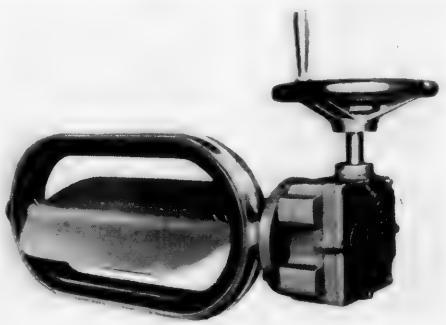
System combines, for the first time under one jacket, long-life cast-iron construction with an indirect, all-copper heat exchanger in a completely factory assembled and wired unit, including sensitive pool aquastat, and high limit protection.

System has a 100-psi ASME pressure rating and may be connected directly to city water lines without the use of pressure reducing valves. The removable heat exchanger consists of multiple-pass finned copper tubes and is designed for low pressure drop. Factory guaranteed against burn-out for a period of 10 years, system is available in five units with input ratings from 108,000 to 210,000 Btuh for use on manufactured, natural, or propane gas.

More Information? Circle Item 51 on Inquiry Card.

Butterfly Valves for Ducts

W. S. Rockwell Co., Fairfield, Conn., has developed a line of control and shutoff butterfly valves for rectangular and flat oval ducts used in industrial and process ventilation and air conditioning. The valve is easily adaptable with the application of simple transitional fittings, the company states.



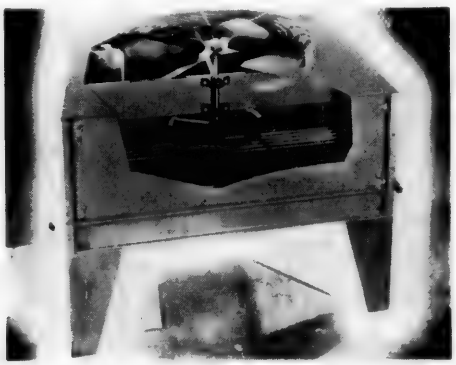
Throttling and shutoff can be controlled by a lever, hand wheel (as shown) or automatically by a pneumatic cylinder, diaphragm operator or electric motor. A dial indicates position of the disc. For automatic control, a valve positioner may be included.

More Information? Circle Item 52 on Inquiry Card.

Air-Cooled Condensers

Manufactured by Danville Div., Bohn Aluminum & Brass Corp., Danville, Ill., remote air-cooled condensers are suited for use in such applications as built-up air conditioning systems, package air conditioners, supermarket refrigeration systems in which multiple compressors are connected to single multi-circuit condensers, refrigerated warehouses, commercial heat pumps, and similar installations.

These condensers are not only adaptable to new construction but can also be used in most cases to convert from water-cooled to air-cooled systems. An



optional feature of these condensers is the Bohn Limitizer head pressure control which makes it possible to maintain the proper operation of remote condensers throughout the year, regardless of weather conditions.

Models RVD and RHD are especially designed to meet the installation and operating requirements of both the air conditioning and commercial refrigeration fields. Vertical air discharge units are ideally suited for location in outdoor areas where low vertical projection of the equipment is desirable or where physical obstructions would interfere with the proper discharge of air from the condenser. The horizontal discharge units are best adapted for installation in outdoor areas where conservation of floor or roof space is desired.

More Information? Circle Item 53 on Inquiry Card.

Urethane Foam Insulation

A new line of rigid urethane foam sheets, designed to meet the growing demand for high-efficiency, space-saving insulation, is introduced by Barrett Div., Allied Chemical Corp., New York, N. Y.

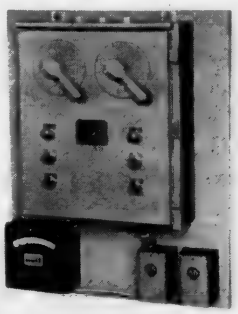
In addition to the standard urethane foam, the firm has introduced a flame-retardant coated version designed to minimize fire hazards during construction.

The urethane insulation is available in panels of various thicknesses up to eleven inches. Blocks of foam suitable for use as pipe insulation and lagging also are available.

More Information? Circle Item 54 on Inquiry Card.

Automatic Pump Control

Weil Pump Co., Chicago, Ill., announces its Vis-A-Trol automatic pump control and liquid level indicator, designed for use with submersible sewage and sump pumps and septic tank effluent pumps.



The automatic control system is combined with a depth measuring device which shows the depth of liquid in the pit. The pumping rate can be compared with the in-flow at all times without looking into the wet pit. It is indicated on the instrument and responds instantly to level changes in the sump.

System can be installed inside buildings as far as 300 ft away from the pumping pit or, where conditions dictate, can be installed in weather-proof enclosures on the outside.

There are no electrical control connections between the wet pit and the control panel. The panel and instrument is a factory wired unit including starters, alternator and high water alarms. Each unit is manufactured to requirements of the particular job and supplies an efficient remote control system.

More Information? Circle Item 55 on Inquiry Card.

Glass Fiber Floor Drain

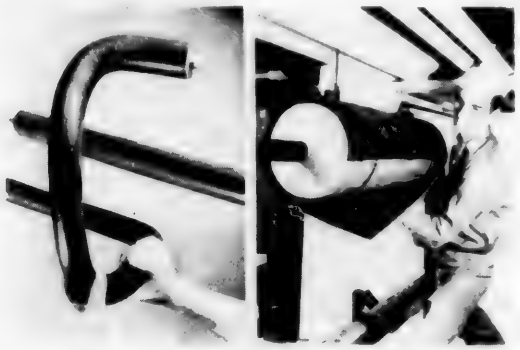
Josam Manufacturing Co., Michigan City, Ind., has added to its line of specialty drains a new model floor drain fabricated of reinforced molded Fiberglas. This drain is intended for use wherever danger from

sparks may be present. Applications include atomic reactor rooms, radiation laboratories and areas where combustible fumes may exist.

More Information? Circle Item 56 on Inquiry Card.

Foamed-Plastic Pipe Insulation

Gustin-Bacon Mfg. Co., Kansas City, Mo., announces an addition to its pipe covering line—a flexible, foamed-plastic pipe insulation called G-B Ultra*Foam. The new product, available in tube or sheet form, is used to insulate liquid cooling and heating lines from sub-zero to 220 deg F, in plumbing, heating, air conditioning, refrigeration, and industrial processing applications.



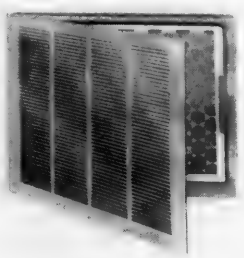
Insulation's closed cellular structure gives it a "k" factor of 0.28 at 75 deg mean temperature, and a water vapor transmission rating of less than 0.1 perm. Product's fire rating is: "self-extinguishing."

The tubular form can be slipped over new piping prior to installation, or slit longitudinally and snapped over existing piping. Sheets of the insulation can be used as pipe covering for sizes over 3-inch IPS.

More Information? Circle Item 57 on Inquiry Card.

Filter Grille Has Hinged Frame

Design and production of a filter grille with a hinged frame and much greater free area is announced by The Auer Register Co., Cleveland, Ohio.



Called ideal for installations where heating or air conditioning units are located in attics, crawl spaces or other inaccessible locations, the new grille has face bars stamped ½-inch wide on ½-inch centers and a 30-degree deflection. In addition to providing greater free area, these face bars eliminate visibility of filter surface and permit installation with deflection up or down.

Ease of installation and filter replacement are additional advantages of grille design, the company reports. No tools are required to replace filters, since a thumb nut and one slip-in filter clip are the only parts removed for replacement.

More Information? Circle Item 58 on Inquiry Card.

"Thermal Pin" Boilers

"Thermal-pin" construction, called a new concept in cast iron boilers, is introduced by Bryant Manufacturing Co., Indianapolis, Ind., in a line of gas fired boilers.

Built to utilize the heat from flue gases, matching external and internal projections (thermal pins) are cast into the boiler sections to transfer heat quickly and efficiently into the boiler water.

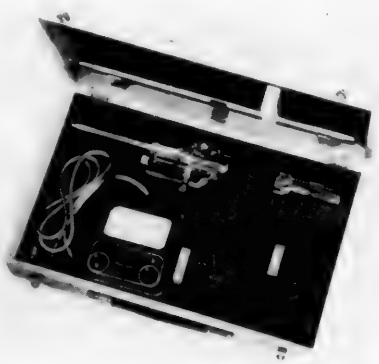
By capturing what would ordinarily be waste heat, the new boiler responds to the thermostat quicker, shortens the operating cycle, and consumes less fuel, according to the manufacturer.

More Information? Circle Item 59 on Inquiry Card.

Improved Portable Psychrometer

An improved portable thermistor psychrometer, which quickly gives precise wet bulb and dry bulb readings for determining relative humidity, absolute humidity, dew point, or enthalpy in air and other gases, is one of a range of temperature and humidity instruments offered by Atkins Technical, Inc., Cleveland, Ohio.

The instrument, the A+ Hygrophil, uses tiny thermistor beads as resistance thermometer elements. Response time is unusually rapid because of the small mass of the temperature sensing thermistor beads and because of the instrument's controlled air



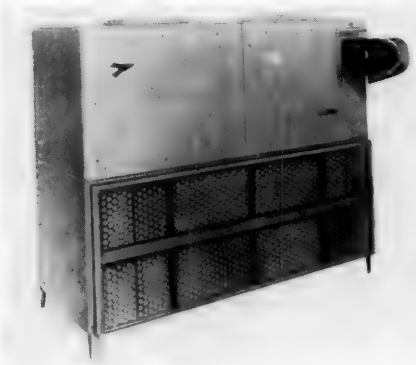
system. Since both wet and dry readings are usually obtained within ten seconds, readings can be taken in confined spaces with limited air available for measurement.

Air speed is controlled by a built-in fan system. Air is drawn over the two sensing thermistors, one dry and one kept wet with a built-in wick and water system. Temperature is indicated directly on the three overlapping scales of the meter in increments of ½ deg F or 0.2 deg C. Accuracy of indication of relative humidity is thus better than 0.5% over most of the scale. The entire system is powered by standard mercury batteries.

More Information? Circle Item 60 on Inquiry Card.

Air Handling Units

Airtemp Div., Chrysler Corp., Dayton, Ohio, announces seven basic models of air handling units with capacities ranging from 2,000 through 15,000 cfm. Units are built in two sections, giving them what is described as the industry's most flexible installation design.



All AH-series units have a fan section and a coil-filter section, and the units are designed for either horizontal or vertical floor installation. The coil section can be turned end for end in the field or mounted horizontally adjacent to the fan section.

Fan section is built with a square cross section which allows the unit to be rotated for a choice of discharge. The two sections facilitate entry through narrow accesses during installation. All coils, either direct expansion or water, may be removed on the job or can be installed after the unit is in place. Tapped openings for venting water coil headers are provided.

More Information? Circle Item 61 on Inquiry Card.

Chemical Refrigerant Dehydrator

A chemical reactivating dehydrator for commercial refrigeration and air conditioning is being manufactured and will be distributed by Federated Electronics Inc., Jamaica, N. Y. The units, which will be made in varying sizes, will serve air conditioning systems of 3-100 hp. A chemical device, the dehydrator is claimed to be more efficient than any existing dehydrator available.

Dehydrator is attached to the pressure line of the central air conditioning system. It includes the following chemical components: acetylenogens, hellos capacitators and molecular aluminates. These, working in combination, are said to extract the maximum amount of moisture from a system. The reactivating dehydrator sends moisture drying chemicals through the system along with the gases for highly efficient drying, whereas absorption units are limited in their capacities, the company states.

More Information? Circle Item 62 on Inquiry Card.

Water Cooler Mounts Flush

Introduced by Temprite Products Corp., Birmingham, Mich., with "completely new sculptured styling intended to complement the clean lines of modern architecture," is a new series of drinking water coolers, known as the WF models.

All plumbing connections are concealed within the cooler cabinet, permitting flush-to-wall installation. Floor space is conserved, and any difficulty of maintaining cleanliness in a narrow open area between wall and cooler has been eliminated with this feature.

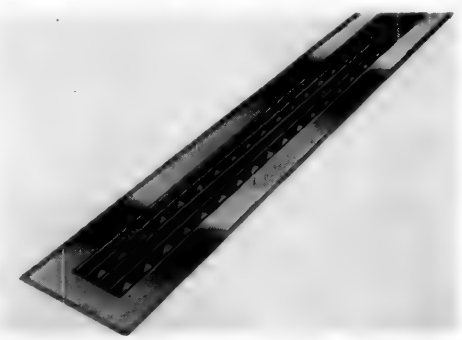
Both finger-tip plus foot controls are standard on all models. Capacities range from 6 to 22 gph to accommodate a complete range of applications. Either air cooled or water cooled condensers are offered.

More Information? Circle Item 63 on Inquiry Card.

Slot-Type Diffusers

Air Devices Inc., New York, N. Y., announces a new series of extruded aluminum Stripline slot-type air diffusers with separate plaster frames and removable cores for heating and cooling applications.

Available in two styles of frames and three types of removable cores with diffusing vanes for ceiling—sidewall—windowsill installations, these diffusers are made in sections or can be used as a continuous



unit by butting the sections together with a built-in interlocking feature that assures perfect alignment, the firm reports.

Entire unit is quickly and easily installed without the use of tools. A unique coil spring-lock eliminates the use of screws and screwholes, and leaves the surface of the unit unmarred.

More Information? Circle Item 64 on Inquiry Card.

Portable Drafting Set

Country Engineering, Inc., Darien, Conn., announces new portable drawing equipment. The Pocket Polyangle, with a standard pad, provides complete drafting facilities anywhere, anytime. It adjusts to a pad for accurate field sketching or drawing to scale, yet is pocket size when folded in its carrying case.

The main scale slides to provide parallel horizontal lines. Spring-loaded angle arm can be snapped into

position of 30-45-60-90-120-135-150 degrees either above or below the horizontal. The arm sets to angles quickly, remains in position, and can be moved horizontally while maintaining angle setting.

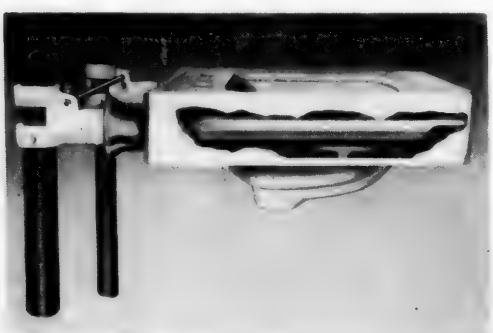
Instrument is constructed of high strength polystyrene and is color tinted to provide contrast to pad.

More Information? Circle Item 65 on Inquiry Card.

Concealed Arm Lavatory Carrier

To help solve the problem of wall-hung lavatory fixtures working loose from their supporting carriers, once they have been installed in commercial and public rest rooms, Jay R. Smith Mfg. Co., Union, N. J., has developed a new type of concealed arm lavatory carrier. Device is claimed to make lavatories easier to install, and to support each fixture more securely off the wall.

Called Sure Set, it features a slotted carrier arm



that lets the installer adjust and set the fixture locking device at the exact dimension and position required to align the locking gripper with the punchings provided in each fixture by the various fixture manufacturers.

A new locking device, called Duo Lock Gripper, tightens onto the fixture to hold it securely to the carrier; it features a double wedged design that grips the fixture in two places.

More Information? Circle Item 66 on Inquiry Card.

Engines for Air Conditioning

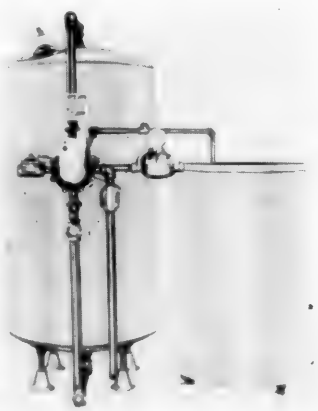
A broad line of power plants, engineered expressly for air conditioning applications and thoroughly field-tested, is offered by Continental Motors Corp., Muskegon, Mich.

These engines are described as providing the ideal combination of those performance characteristics essential in air conditioning applications, including the ability to operate for long periods with only routine attention. They include both L-head and overhead valve types, for operation on all fuels including diesel oil and natural gas.

More Information? Circle Item 67 on Inquiry Card.

Line of Water Softeners

Series 500, an economy line of water softeners, is introduced by Elgin Softener Corp., Elgin, Ill., to meet the ever increasing demand for more soft water at lower cost. Through standardization of design in models ranging from 195,000 to 1,920,000 grains capacity, these water softeners will handle most any soft water requirement.



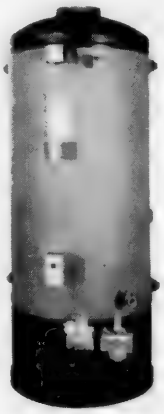
Simplified manual operation is provided by a single lift-turn multiport valve. Automatic models like the one pictured utilize the same multiport valve principle with lifting and turning operations accomplished automatically by motor, timer, and clock arrangement.

In addition to this clock actuated four-step regeneration cycle, all automatic models have an auxilliary pushbutton which permits additional regenerations if required by heavy loads. The duration of each regeneration step can be regulated by simple adjustment of a motor operated timer.

More Information? Circle Item 68 on Inquiry Card.

Automatic Hot Water Heater

Four new AGA and ASME approved gas operated automatic hot water heaters are announced by Ewing Mfg. Co., Oklahoma City, Okla. All are vertical models, which conserve valuable floor space, and all controls are mounted in place, ready for quick installation and immediate operation.



These heavy duty heaters are designed and engineered for use where quality and compact construction, easy installation and low maintenance features are important and they eliminate the necessity of storage tanks.

Model 200 has a Btu input of 320,000, provides recovery of 268 gallons per hour at 100-deg temperature rise and has storage capacity of 76 gallons; Model 400 has 535,000 Btu input, recovery rate of 449 gph at 100-deg temperature rise and has storage capacity of 135 gallons; Model 600 offers 780,000 Btu input, provides hourly recovery of 655 gph at 100-deg temperature rise and has storage capacity of 170 gallons; the largest, Model 800, has 945,000 Btu input, storage capacity of 217 gallons and delivers 793 gallons recovery per hour at 100-deg temperature rise.

Heaters operate on natural, mixed or L. P. gas. Each unit is equipped with two heavy-duty maganesium rods; all controls are self-generating, with safety feature.

More Information? Circle Item 69 on Inquiry Card.

Electric Counterflow Heaters

Availability of a line of electric counterflow heating units, formerly sold by Electrend Products Corportation, is announced by Edwin L. Wiegand Co., Pittsburgh, Pa. Heaters, which will retain the Electrend name, are designed for residential heating and are also adaptable for many commercial types of comfort heating applications, as motels and churches.

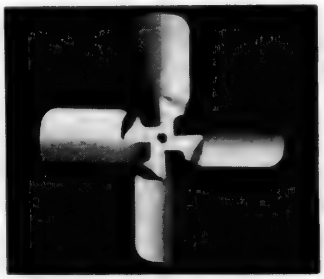
Heaters have a slender galvanized vertical duct with a quiet air intake impeller at the top and a heating element and warm air delivery outlet at the bottom. All models pull in warm air that collects near the ceiling and reintroduces warmer air at floor level.

Some models are recess-mounted; others are designed for surface mounting. Units are 6½ ft high and easily installed between standard 16-inch studding. They operate on 230 volts, delivering 150 cfm.

More Information? Circle Item 70 on Inquiry Card.

Axial Fans

The R-series axial fans announced by The Torrington Manufacturing Co., Torrington, Conn., are, at competitive cost, reported to be the most efficient, versatile large fans in both belt and direct-drive that are available for such applications as cooling towers and exhaust units.



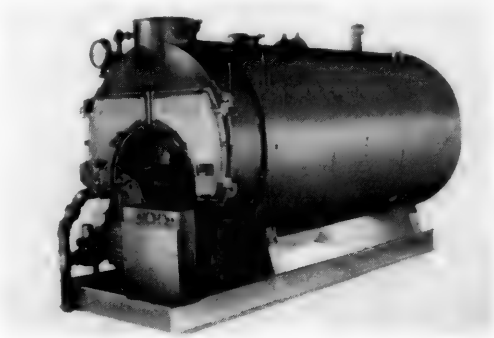
Fans are obtainable in nine standard diameters from 24 to 60 inches and in blade pitches of 20, 27 and 40 degrees. The inherently high operating efficiency of the new fan design, according to the company, indicates major savings can be realized by using smaller capacity motors for equivalent fan performance. Hence, motor cost reductions up to $20.00 a unit may be realized.

More Information? Circle Item 71 on Inquiry Card.

Packaged Commercial Boilers

The Scottie Junior series of Kewanee Scotch-type forced-draft packaged boilers, for high and low pressure operation and featuring forced draft firing with light oil, gas or combination gas-oil, is announced by American-Standard Industrial Division, Detroit, Mich.

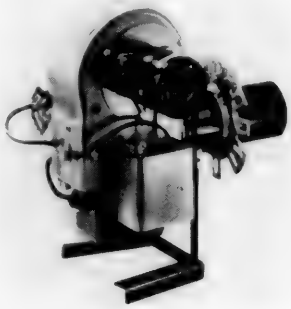
Supplementing the firm's existing line of commercial packages, the new units have output ratings of 20 to 150 hp for high pressure and 672,000 to 5,040,000 Btuh for low pressure. Ratings are conservatively based on five square feet of heating surface per horsepower for adequate reserve capacity. The high pressure units are designed for 125 to 150 lb steam wp, with higher pressures on application; the low pressure units are designed for 15 lb steam wp and 30 lb water wp, with higher water wp available on application.



More Information? Circle Item 72 on Inquiry Card.

Power Gas Burner System

The Barber Manufacturing Co., Cleveland, Ohio, announces the Ventronic electric control system that provides positive, safe, dependable power gas burner firing. It is said to reduce the problem of pilot outage so common in installations such as horizontal furnaces, down-draft furnaces and boilers, industrial incinerators, grain dryers, etc.



The power gas burner system combines the following features in one package: A 60-second-plus purge period before each burning cycle; continuous spark operation during burning cycle; and automatic recycling of ignition.

As the thermostat or controller calls for heat, the burner blower starts and purges or vents the combustion chamber for one minute before the sequencing relay cuts in to energize the electrode which releases a 6000-volt spark across the pilot. Then the pilot valve opens and the pilot ignites. In approximately 35-seconds (in a cold chamber) the lighted pilot heats the thermocouple generator providing sufficient power to automatically open the main gas valve.

It is important to note, the company states, that the electrode continues to operate during the entire burning cycle ensuring pilot re-ignition at all times, should it go out for any reason.

More Information? Circle Item 73 on Inquiry Card.

Air Cooled Condensers

A heavy duty, air cooled Aircon condenser, with horizontal or vertical air flow for air conditioning or refrigeration, and available in 19 sizes from 7½ to 100 tons nominal capacity in a single unit, is offered by McQuay, Inc., Minneapolis, Minn.

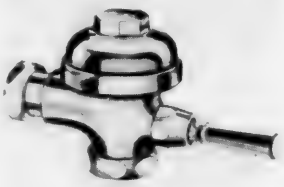
Unit is designed to provide quiet, trouble-free refrigerant condensing, without water, for all air conditioning and refrigeration applications for use with Refrigerants 12, 22 or 500. Multiple installations permit attainment of an unlimited capacity range.

Automatic head presure control for year round operation is available with the company's Seasontrol method, or the Dampertrol method with opposed blade face dampers.

More Information? Circle Item 74 on Inquiry Card.

Compact Flush Valve

What is described as the first radical change in flush valve design is announced by Watrous Div., Imperial-Eastman Corp., Chicago, Ill.



This compact new valve, called the Neptune, features a streamline design that is ⅔ the size and 26% lighter in weight than standard diaphragm valves, the firm reports.

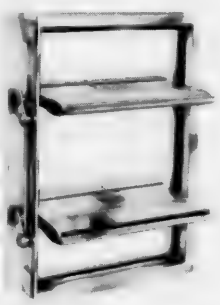
The light-weight inside cover is made of Delrin, DuPont's newest industrial material. It is unconditionally guaranteed by Imperial-Eastman for 25 years of trouble-free service. In addition, it is said that this key part won't vulcanize to the rubber diaphragm which has long been a maintenance problem.

Valve's handle packing is a spring loaded, self-tightening type. Packing itself is a special moisture-proof material impregnated with a formulation which acts as a lubricant for the stem as well as a water-proof seal.

More Information? Circle Item 75 on Inquiry Card.

Aluminum Damper

An improved aluminum damper with airfoil double blade is announced by Arrow Louver & Damper Corp., Brooklyn, N. Y. Major improvement is the elimination of hardware from the blade.



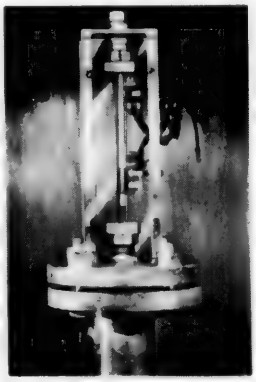
Precision design and the use of special vinyl stripping makes these aluminum dampers more air-tight than their steel counterpart, the firm reports. Called lighter and easier to install, they require no painting or other maintenance.

Other advantages claimed by the company are these: Because the duct size is reduced, there is less friction, less turbulence. Operation is quieter. When closed, the double blades act as an insulator. And, because of special pinlock groove design, positive blade turning is obtained.

More Information? Circle Item 76 on Inquiry Card.

Liquid Level Indicating Control

A liquid level indicating control which provides trouble-free and accurate visual read-out of liquid level variations in refrigerant vessels is now commercially available at low cost. Called Gage-O-Matic and manufactured by H. H. McKinnies Co., Milwaukee, Wis., the gage combines a variety of features into a simple, dependable unit.



The device utilizes visual indication to provide constant information to the operator as to status and behavior of liquid in the vessel. In addition, Gage-O-Matic is manufactured to order, with single or multiple control switches to provide automatic operation of pumps, valves, indicator lights, alarm bells, compressor shut-down and signal circuits.

The control has only five major parts: the float chamber, guard section, control switch or switches, combination float ball, rod and magnet-indicator and an indicator glass. There are no outside moving parts. Control switches are located away from the cold influence of the refrigerant, but are so constructed that they will continue to function even if covered by frost or ice.

More Information? Circle Item 77 on Inquiry Card.

Electric Heating Control System

A low-cost automatic set-back control system, designed to reduce heating costs 20-50% in motels, schools, churches and residences, is announced by Emerson Electric Manufacturing Co., St. Louis, Mo.

The set-back control lowers or raises the temperature of unoccupied rooms by remote control, greatly reducing heating and power costs, and saving endless steps. With this system, one simply flicks a switch at the central control panel and the thermostat in a room drops to "low" or goes up to "normal." The occupant, however, in the motel unit, classroom, etc., can still adjust the temperature at any time.

Specially designed to operate efficiently with the company's electric heating units, this remote control system cuts the cost of expensive heating of unoccupied rooms and can often pay for itself in 15 months or less in power cost savings, according to the firm. Installation of the set-back control system is simple, requiring no special equipment; no low-voltage transformers or relays are required.

More Information? Circle Item 78 on Inquiry Card.

Make-Up Air Units

A new series of horizontal, dual-fan, direct-gas-fired make-up air units, designated Sun-Flo Model AH-2, is announced by Metals Engineering and Manufacturing Co., Inc., Detroit, Mich.

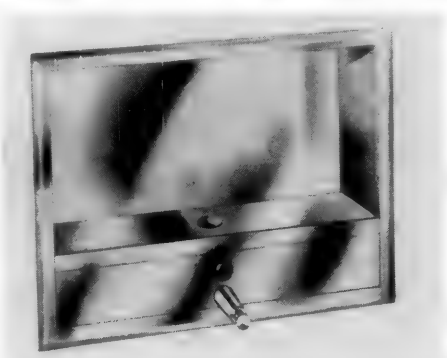
Capacities of nine sizes in the series range from 20,000 to 60,000 cfm for air, and from 1,875,000 to 6,000,000 Btuh. Each unit is designed to maintain a constant discharge temperature of 80 deg F throughout the entire range of outdoor temperature from —15 to + 80 deg. Controls are automatic.

Unit shown is ceiling mounted and supplies air for an automotive spray booth, also made and installed by the manufacturer. Capacity for make-up air is 25,000 cfm.

More Information? Circle Item 79 on Inquiry Card.

Soap Dispenser and Shelf

A combination soap dispenser and shelf designed for wall-recessed installation is announced by Bobrick Dispensers, Inc., Los Angeles, Calif.



Catalogued Model B310 for dispensing liquid soap and Model B315 for dispensing liquid soap in lather form, the units become the first product offering in the company's "Bob-Recessed" line of recessed washroom equipment.

More Information? Circle Item 80 on Inquiry Card.

(Continued on page 119)

IONS AFFECT BEHAVIOR

(Continued from page 12)

Although the physiological and behavioral effects of air ions have been demonstrated experimentally since 1931, the advent of the nuclear submarine and the approach of manned space flight has put new emphasis on understanding the effects of these charged particles. Atmospheric conditions which are normally considered to have insignificant effects on performance or, at most, are regarded as laboratory curiosities, may become of paramount importance in the sealed capsule environment. For example, prolonged exposure to low levels of atmospheric contaminants may produce serious physiological changes, with an adverse effect on human performance.

Influence on Ventilation Design

In addition, in the past decade, nuclear testing and the increasing use of high-voltage electrical equipment has tended to raise the amount of ions in the atmosphere of our living and working spaces. Thus, the control of air ions may prove to be important in maintaining an optimal environment, not only in space capsules but in homes and business establishments.

Ions are produced in the lower atmosphere principally by naturally radioactive materials in the earth's surface or in the air, and by cosmic radiation. Other naturally occurring sources include falling snow, water spray, and combustion. Electrical properties of the atmosphere have long been blamed for the irritability and depression felt by people exposed to winds such as sirocco of the Mediterranean, the foehn of Switzerland, and the chinook of the Pacific Northwest.

Among the man-made sources of ions are combustion processes, high-voltage discharges, nuclear tests, and electrical equipment. For experimental purposes ions can be produced and controlled by hot wires, X-rays, radioisotopes, high-voltage discharges, and ultraviolet photoionization.

Effects on Human Beings

Dr. Schutz and Mr. Duffee's report reviewed the work of a number of research groups which have studied the effects of air ions on human beings. Investigations on the effect of ions on human comfort indicate that, in general, negative ions produce a pleasant feeling accompanied by relaxation and sleepiness. Positive ions are generally found to produce an unpleasant feeling accompanied by headache, dizziness, nausea, and sore throat.

Studies of the effects of ions on a person's performance have been less conclusive. For example, a study supported by the Air Force's Wright Air Development Division reported no statistically significant differences in performance with either positive or negative ions. The difficulty here lies in isolating the effects of ions from the effects of other environmental factors. Temperature, humidity, light, noise, or gases can all affect the behavior and performance of human beings. Behavior and performance are also influenced by: the physical condition, age, and sex of the subjects; the degree and type of stress they may have undergone; previous ion exposure; and the type of performance tested.

One of the ways in which ions affect performance is illustrated by a Russian study. After 25 days of inhaling negative ions for a 15-minute period daily, athletes maintained a standard grip on a dynamometer 46 per cent longer than control subjects. After 9 days of negative ion treatment, endurance as measured on a treadmill increased 55.9 per cent.

Theories Advanced

According to the Battelle scientists, theories as to how air ions affect the human body involve electrical, chemical, or hormonal mechanisms—either separately or in combination.

There are several types of electrical influence theories. One is that the biological effect of ions occurs in the cells of the body through a change in conductivity of the cell structure or the electric charge of the cell membrane. Another hypothesis states that ions act directly upon the autonomic nervous system by stimulating sensory nerves endings in the skin. According to a third theory, electricity is "metabolized" through the lining of the lungs and the red corpuscles.

The chemical mechanisms that have been suggested fall into two categories. The first concerns a change in atmospheric composition due to the presence of ions or the change in the activity of atmospheric gases. The second group postulates that the ion generator itself may produce gases and that it is these gases, rather than ions, which produce an effect. Of considerable interest is a study showing that air ionization affects the oxygen-carrying capacity of the blood by altering the relative acidity and alkalinity of the blood and its carbon dioxide combining power.

However, the most promising of the three general theories, in the opinion of Dr. Schutz and Mr. Duffee, is one involving the action of hormones advanced by A. H. Frey of General Electric's Advanced Electronics Center. The basis of this hypothesis is that the operation of ions on human beings may be due to an influence on the adrenal cortex and the subsequent change in the production of corticoids. This hypothesis is supported by the following observations: (1) atmospheric ions do affect the adrenal cortex, (2) the secretion of the different corticoids can vary independently of each other, and (3) there is a similarity between the effects of positive and negative ions and the action of the glucocorticoids and mineralocorticoids.

(Continued from page 117)

New Centrifugal Fans

Several new centrifugal fans are announced by General Blower Co., Morton Grove, Ill., a subsidiary of Ilg Electric Ventilating Company.

Type BG Util-A-Vent direct-drive models are available in five sizes and 14 capacities to meet the needs of supply and exhaust applications where low-pressure, small-volume, quiet operations are desirable. Type FC Belted Util-A-Vents are offered in two models with adjustable V-belt drives for applications where speed adjustments are required.

Extremely compact models are available for building into machinery. Gasoline-engine-driven models and portable models are also a part of the BG Utili-A-Vent line.

Type GP volume centrifugal fan is designed for exhausting fumes from chemical laboratories, handling light dust from polishing wheels and grinders, or any small exhaust purpose where considerable resistance is caused by long run of duct. It can often be built into other machines and is available in 4 sizes and 9 capacities.

Type GPE pressure exhaust centrifugal fans are suitable for a wide variety of applications, including dust removal, conveyance, exhaust, supply blast and air supply. They are available in 4 direct-connected and 3 belted sizes.

Circle Item 81 on Inquiry Card.

Humidity Controls

A pair of compact humidistats for control of humidifier and dehumidifier units in air conditioning systems is introduced by Ranco Inc., Columbus, Ohio. Called the J10 and J11, these wide-range humidistats respond to atmospheric moisture content within a confined area to automatically cycle humidifying or dehumidifying equipment. Both controls operate efficiently within a 20 to 80% relative humidity range.

Circle Item 82 on Inquiry Card.

MAID-O'-MIST Inc.
HEATING SPECIALTIES
automatic

AUTO-VENTS®

NO. 67 and 68

Tiny but terrific!
Simple to install in
LIMITED SPACE!

They vent air
CONTINUOUSLY
in hot water heating and chilled water cooling systems

No. 67 is 3⅛" x 1 9/16" with ⅛" IP male connection

No. 68 is 4" x 1 9/16" with ¼" IP male connection for pressures up to 35 lbs.

Air pockets are eliminated automatically with these small but efficient Auto Vents . . . and water then flows thru the pipes freely. They have a well-earned reputation for correcting hydronic troubles fast—at very modest cost. Learn more about these two inexpensive wonder-workers.

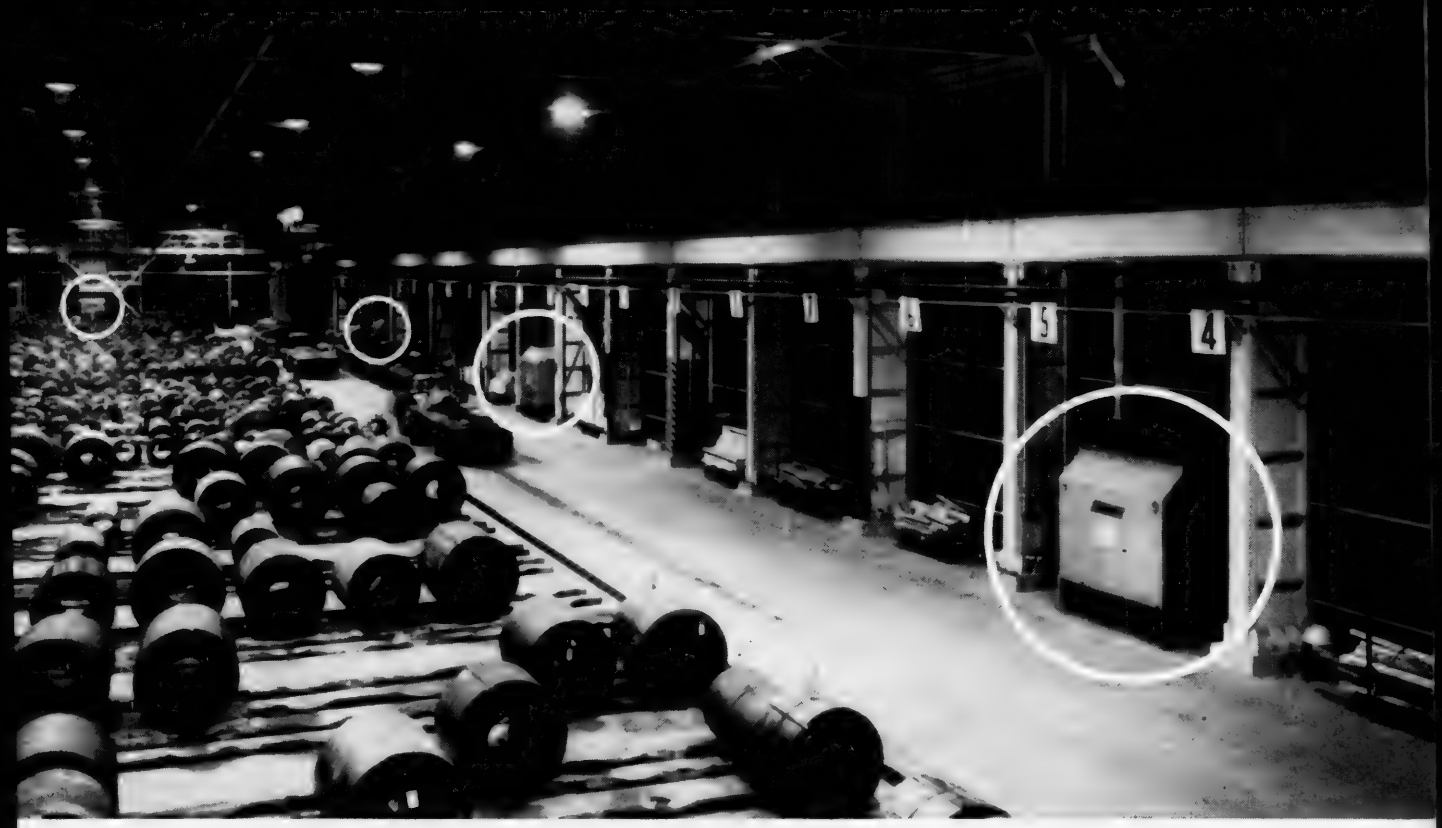
WRITE FOR CATALOG

MAID-O'-MIST, Inc.

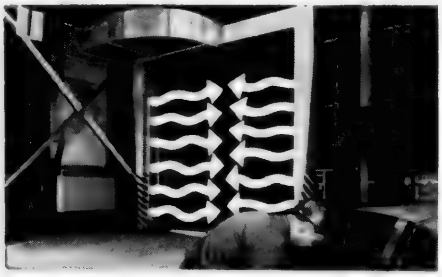
3217 North Pulaski Road Chicago 41, Illinois

another *LENNOX* installation

DESIGNED TO DO MORE THAN JUST HEAT AIR



Lennox industrial systems provide complete comfort including ventilation, make-up air, fresh air and cooling



How to eliminate "open door" drafts

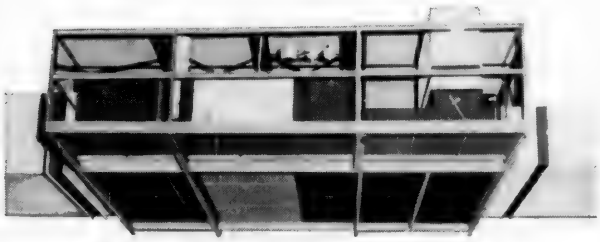
Expensive and undesirable drafty areas are created by outside doors which open frequently. (18° air, moving at 15 m.p.h., cools hands and faces just as much as still air at −40°.) Such conditions are intolerable to workers, cuts productivity. This company's engineers solved the problem inexpensively with "door heaters" as pictured. Ducts from the Lennox heater release jets of warm air to blanket the door opening. Cold air is tempered before it can affect workers.

Most industrial buildings, such as the Jones & Laughlin storage and shipping building pictured above, can be expensive to heat. Some heating systems simply "dump" heated air into the working area of these buildings, and others attempt to heat "spots." These systems waste heat, cause drafts, create "hot heads and cold feet," and many times high ceiling temperatures. Lennox industrial heaters overcome these faults. Large capacity blowers and low internal resistance of the heaters make it possible to discharge large volumes of high velocity air *above* the heads of the workers. This produces complete air distribution, eliminating hot spots and uneven temperatures. These units are designed to supply fresh air ventilation and make-up air as required. Cooling equipment can also be added to each of these heaters to provide complete air conditioning. If you would like to receive more information about the Lennox line of industrial heating and cooling equipment, write LENNOX, 614 S. 12th Ave., Marshalltown, Iowa.

LENNOX: A Single Source for Heating, Ventilating and Air Conditioning

Ductless installation in 102,000 sq. ft. food warehouse kept initial costs down... Lennox efficiency cuts operating costs

This company had previously used conventional suspended unit heaters, but switched to Lennox direct-fired heaters to get more even heating and tempered fresh air for ventilation. Three highly efficient Lennox units now heat and ventilate the entire area of the warehouse, with a minimum temperature differential throughout the building.



You can heat, cool or ventilate any existing building with Lennox equipment

The complete line of Lennox equipment, and your Lennox representative will make your designing and buying job easier . . . providing one central source for direct-fired heaters with up to 2,000,000 Btuh capacity, and cooling and ventilating for any job.

Don't be satisfied with less than

LENNOX

Heats • Cools • Treats and Moves Air

LENNOX INDUSTRIES INC., FOUNDED 1895 — MARSHALLTOWN AND DES MOINES, IOWA; COLUMBUS, OHIO; SYRACUSE, NEW YORK; DECATUR, GEORGIA; FT. WORTH, TEXAS; SALT LAKE CITY, UTAH; LOS ANGELES, CALIFORNIA. LENNOX INDUSTRIES (CANADA) LTD. — TORONTO, MONTREAL, CALGARY, VANCOUVER, WINNIPEG.

Improves Plan Identification

One of the useful features of Plan Hold vertical files has been the speed with which a given print can be found. According to Plan Hold Corp., South Gate, Calif., this feature has now been improved by the addition of a clip-on plastic window for each binder to hold and protect the identification card.

Henceforth the 3-inch plastic window will be supplied with each new binder, together with I.D. cards of the same length and wide enough to take three lines of type. The window clips securely onto the binder backing. This assures positive and lifelong identification for the file and is adaptable to any identification system.

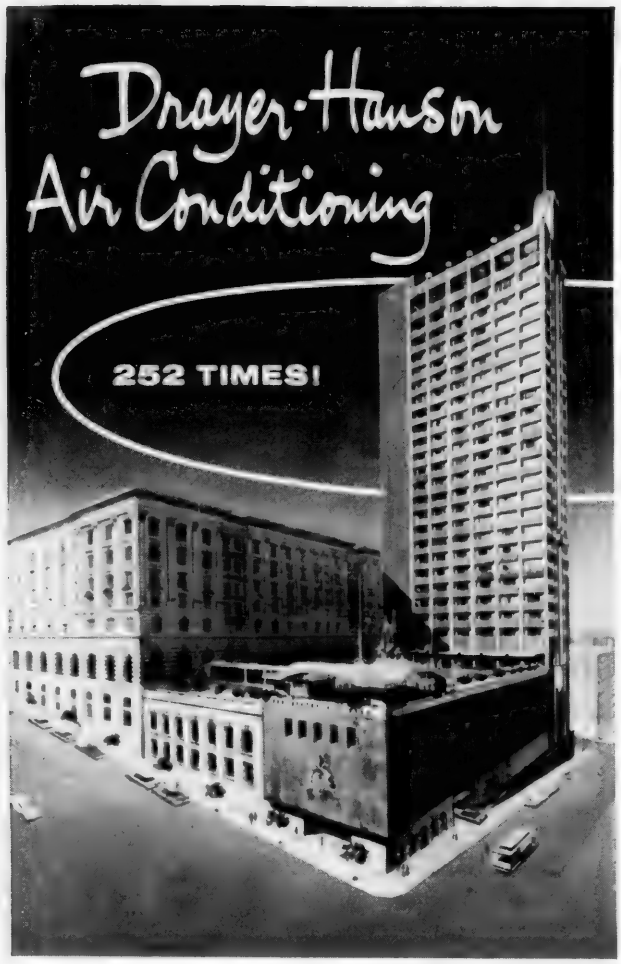
More Information? Circle Item 83 on Inquiry Card.

Equipment Thermometers

U. S. Gauge Div., American Machine & Metals, Inc., Sellersville, Pa., announces Series 8000 equipment thermometers. These vapor tension actuated thermometers will serve as remote temperature indicators for use with equipment such as food display cabinets, refrigerators, milk coolers, cooking vats, ovens, incubators, diesel and gasoline engines, air ducts and temperature operated valves.

They are center back connected and normally panel mounted, but may be custom designed for individual applications. These thermometers are available optionally with the company's front or rear-adjusted Zero Set, which requires only a screw driver for recalibrating.

More Information? Circle Item 84 on Inquiry Card.



New 29-story Tower
AND EXHIBIT HALL
AT SAN FRANCISO'S FAMED
Fairmont Hotel
D-H'S POPULAR SPOTAIRE LRC'S SOON
IN ALL INDIVIDUAL ROOMS & SUITES!

CREDITS: ARCHITECT: Mario Gaidano, AIA. ENGINEER: Edward Hill & Associates. AIR CONDITIONING CONTRACTOR: James A. Nelson Company. D-H SALES AGENT: E. C. Cooley Company.—All of San Francisco.

Request Brochure 150.01

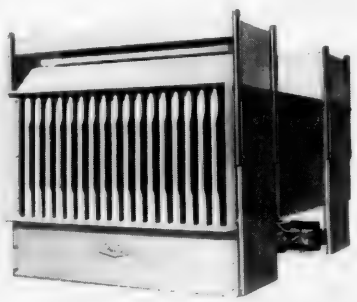
d-h HP

drayer-hanson

DIVISION OF
HI-PRESS AIR CONDITIONING OF AMERICA, INC.
3301 Medford Street, Los Angeles 63, California
(Cable: Cliconi, Los Angeles)

Gas-Fired Duct Furnaces

Peerless Manufacturing Div., The Dover Corp., Louisville, Ky., announces its new line of gas-fired Uni-Matic duct furnaces. The line consists of two series. The large series, 150,000 through 300,000 Btuh, can be ganged together for ease of installation in extremely large installations. The smaller sizes



50,000 through 125,000 Btuh, are for individual duct systems and are designed for ease of access to the control section.

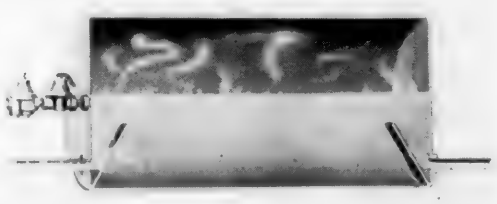
The large series features optional flue take-off, aluminized steel or stainless steel heat exchangers, and a wide choice of controls.

More Information? Circle Item 85 on Inquiry Card.

Air-Eliminating Expansion Tank

General Automatic Products Corp., Baltimore, Md., offers a new model of its DeAirator-Expansion Tank.

The company explains that the tank is installed in the main on the supply side of the boiler, and that all heated boiler water passes through it on the way to heating units. Entrained air and boiler vapors are released by a system of strategically placed baffles and trapped in the tank. By feeding make-up water into the tank, entrained air is immediately trapped.



Tank serves as the only air-eliminating device required on series-loop baseboard systems, as well as an expansion tank and tempering device on circulator starts. New model is said to decrease installation time very considerably, and to effect substantial savings over separate devices.

More Information? Circle Item 86 on Inquiry Card.

Air-Powered Operators

A new line of air-powered operators provides automatic or pushbutton remote control of ball valves manufactured by Hills-McCanna Co., Chicago, Ill.

Vertically mounted operators for valves from ¼ through 8-inch sizes are totally enclosed to protect all moving parts from the atmosphere. When a series of automated valves are mounted side by side, this type of operator permits closer spacing. A bonnet-mounted pneumatic operator is shown in the photo below.

Horizontally mounted cylinder-and-lever type operators are available for all valves from 3 through 8-inch sizes. They cost less than the top-mounted type and their over-all height is less so that they will fit more conveniently where overhead is restricted.

Both types of operators are sold integral with the valves or separately for installation on valves already in service. Optional accessories include a solenoid valve for electrical control, limit switch for remote on/off indication, and a fail-safe device to return the valve to open or closed position in event of air system failure.

More Information? Circle Item 87 on Inquiry Card.

Gas-Fired Incinerator Burners

An improved line of packaged incinerator burners with input capacities up to 900,000 Btuh is being manufactured by Combustion Div., Eclipse Fuel Engineering Co., Rockford, Ill. Eight burner sizes are available for incinerator use in industry, apartment buildings, institutions, and similar types of applications.

Series 800 SIB gas-fired burners offer several important new features, according to the manufacturer: Burner nozzle design gives improved flame retention, stability, and grounding area; adjustable gas cocks in the pilot gas line permit easy adjustment of air/gas ratio to the pilot; and, pilot and flame rods are located at the top of the burner to keep them free of clogging ash deposits.

More Information? Circle Item 88 on Inquiry Card.

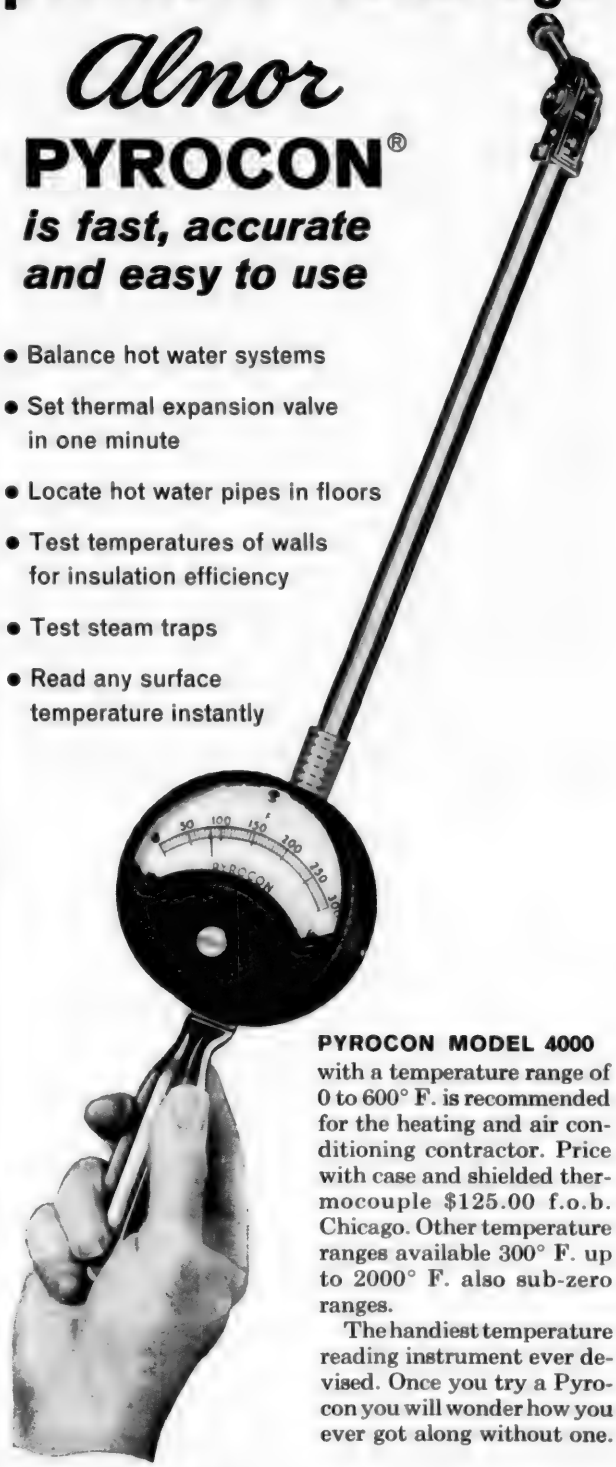
For Surface Temperature Readings

Alnor

PYROCON®

is fast, accurate and easy to use

- Balance hot water systems
- Set thermal expansion valve in one minute
- Locate hot water pipes in floors
- Test temperatures of walls for insulation efficiency
- Test steam traps
- Read any surface temperature instantly



PYROCON MODEL 4000 with a temperature range of 0 to 600° F. is recommended for the heating and air conditioning contractor. Price with case and shielded thermocouple $125.00 f.o.b. Chicago. Other temperature ranges available 300° F. up to 2000° F. also sub-zero ranges.

The handiest temperature reading instrument ever devised. Once you try a Pyrocon you will wonder how you ever got along without one.

Alnor INSTRUMENTS

ALNOR INSTRUMENT CO.

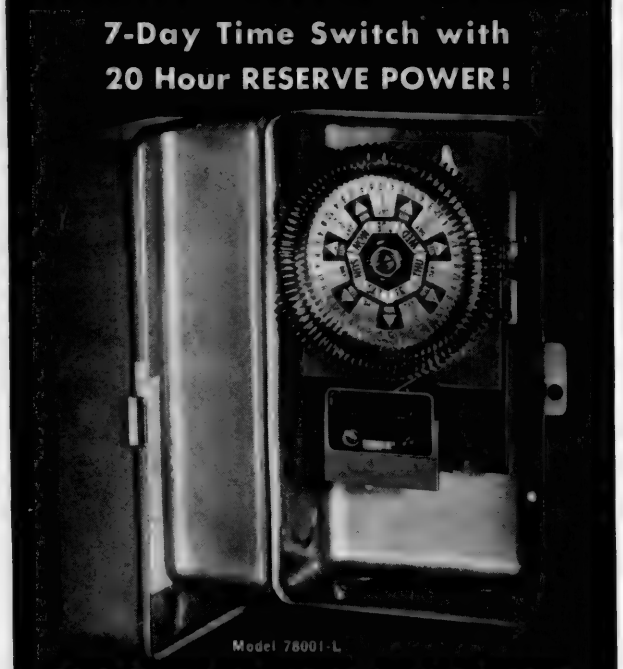
Division of

Illinois Testing Laboratories, Inc.

Room 570, 420 N. La Salle St., Chicago 10, Ill.

AUTOMATIC HEATING DESPITE POWER FAILURE

7-Day Time Switch with
20 Hour RESERVE POWER!



Ideal Control for Heating, Air Conditioning, Ventilating, and Lighting in Schools, Public Buildings and Offices.

Check These Exclusive TORK Features:

- Should power fail precision spring mechanism takes over instantly . . . keeps on time for 20 hours!
- When power resumes electrically wound spring rewinds 10 times faster than used.
- Up to 12 operations a day with 2 hour minimum settings. Dial revolves once a week permitting longer or shorter periods of operation for each individual day, as well as skipping selected days.
- Choice of easy-to-set tab-type tripper dial . . . OR conventional ON-OFF dial!
- Available with Single Pole Single Throw, Double Pole Single Throw, Single Pole Double Throw, and Double Pole Double Throw switching.
- Highest capacity of any 7-Day Time Switch . . . up to 55 Amperes per pole.
- Compact, rugged design . . . same size as 24 hour models!
- Available without case, with bracket . . . or with Flush Enclosure, for panel mounting!

Here is the safest, most dependable Time Switch made . . . designed to meet the highest quality standards of Consulting Engineers and Architects. Insures comfort — no danger of Time Switch failing to operate when needed due to power failure. Economical too! No need for service screws to reset Time Switch after power failure.

Complete TORK catalog yours for the asking

TORK TIME CONTROLS, INC.
MOUNT VERNON, NEW YORK

In Canada: DOMINION ELECTRIC MANUFACTURING CO., LTD., TORONTO
Most Complete Line of Time Switches for Heating, Ventilating, Air Conditioning, Refrigeration, Water Softening, Sewage Disposal, Pumping, and General Electrical Applications.

Room Air Conditioners

Airtherm Manufacturing Co., St. Louis, Mo., announces its line of room air conditioners for 1961. Models are available to meet every design and installation requirement.

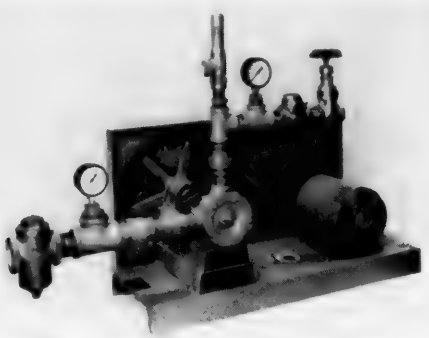
These new room air conditioners—called Unitaires—are called particularly suitable for use in hotel rooms, offices, hospitals, apartments, and motels. All air conditioning functions—cooling, heating, dehumidifying, filtering and introducing of outside air—are controlled separately on each unit, thereby assuring maximum individual comfort. Each room can maintain its own desired temperature and has its own separate air supply.

More Information? Circle Item 89 on Inquiry Card.

Packaged Fuel Pump Set

A completely packaged fuel pump set for industrial fuel oils, which contains all of the accessories required to perform the multiple functions of fuel transfer, pressure boosting and fuel straining in one operation, is available from Walter H. Eagan Co., Inc., Philadelphia, Pa.

The standard single set includes a low-speed rotary



pump with a 2 to 1 ratio of fuel pumping to fuel burning for given boiler horsepowers; single or double V-belt drive; basket-type single or duplex suction strainer; vacuum gage; return-to-tank relief valve; discharge check and gate valves; and pressure gage.

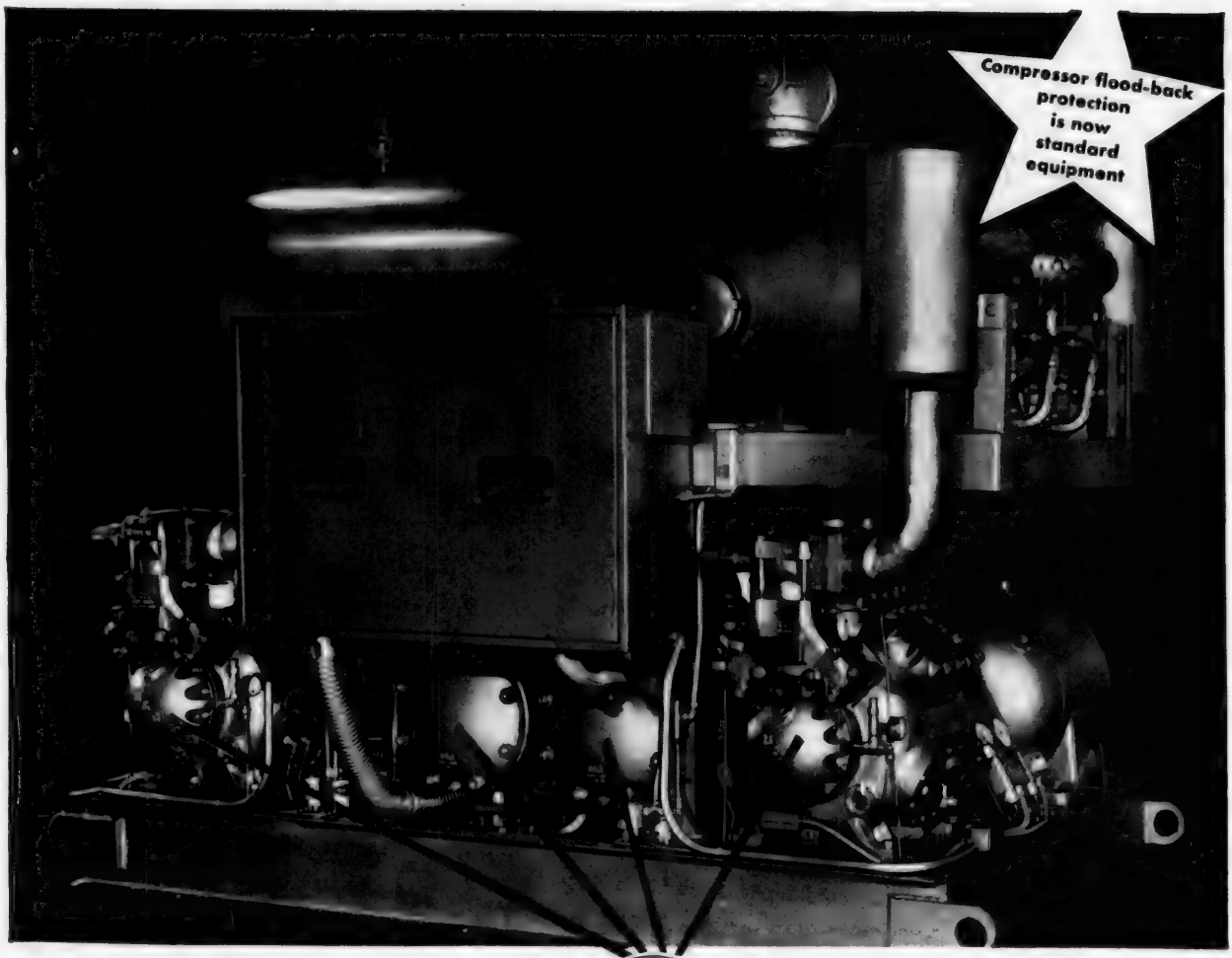
More Information? Circle Item 90 on Inquiry Card.

3-Pass Packaged Boilers

Arkos Manufacturing Co., Div. of Arnold A. Kosarin & Assoc., Inc., Detroit, Mich., announces a full line of three-pass packaged boilers, with forced draft design ranging from 15 to 500 hp.

These boilers are available for low or high pressure steam or hot water, and are designed for burning gas, oil, or combination fuels. The design features front-end cleaning without disturbing the burner or fuel piping; a rear access door for inspection without removing the entire rear plate; elimination of horizontal refractory baffles; and large furnace volume.

More Information? Circle Item 91 on Inquiry Card.



NOW 2 COMPLETE CIRCUITS IN ONE COOLER

Another example of B&G creative engineering!

The B&G Package Liquid Cooler is now available *with two complete refrigeration circuits*...dual compressors, dual condensers and a single evaporator! It has a capacity reduction to 25%—in stages of 100, 75, 50 and 25%. All operative and safety controls are installed and pre-wired.

An outstanding feature is the automatic lead-lag selector switch. In operation, No. 1 motor and compressor handle the load until cooling requirements are satisfied or until No. 2 unit needs to be called into use.

On the next starting, No. 2 unit picks up the load. Therefore each motor and compressor gets equal usage. This dual arrangement is also valuable because it provides stand-by protection in case of emergencies.

Remember, too, that all major parts of B&G "package" units are manufactured and guaranteed by Bell & Gossett Company...*one* responsibility for satisfactory operation.

Send for complete specification and application data on B&G Air Conditioning and Refrigeration equipment.

BELL & GOSSETT
COMPANY
Dept. RGQ-4, Morton Grove, Illinois

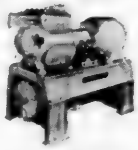
Canadian licensee: S. A. Armstrong, Ltd., 1400 O'Connor Drive, Toronto 16, Ontario

A FULL LINE OF REFRIGERATION AND AIR CONDITIONING "PACKAGES" AND COMPONENTS

B&G Evaporator

B&G Centrifugal Pump

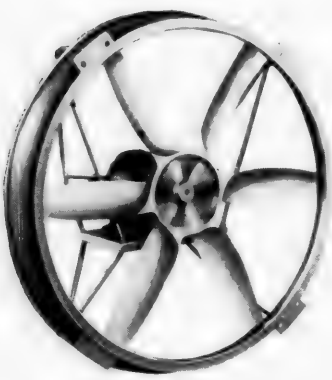
B&G Condenser


B&G Condensing Unit

Standardize on

HARTZELL PROPELLER FANS

for low cost,
high efficiency industrial ventilation



All Hartzell fans are designed and built specifically for the punishing demands of heavy industrial service. All feature cast aluminum alloy propellers and the exclusive Hartzell curved orifice Air Seal ring which eliminates turbulence and backflow of air at the propeller tips. Standard propellers in sizes from 12" to 60" plus special Lo-Noise, high pressure and reversible propellers. All can be furnished in standard direct-connected, ring-mounted models, in panel or duct section mountings, or in special belt-drive, pulley-drive or extension-shaft construction.

Hartzell PROPELLER FAN COMPANY
Division of Castle Hills Corp. • PIQUA, OHIO
(HARTZELL)

BRIEFLY STATED NEWS ITEMS

Rocky Mountain Chapter To Host ASHRAE Annual Meeting

The 68th Annual Meeting of the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) will be held June 26-28 at the Denver Hilton Hotel, Denver, Colo.

The program features a series of three technical sessions, four symposiums, forums and committee meetings. Among the fifteen papers to be presented at the technical sessions will be those on steam vacuum refrigeration; heat and mass transfer in dehumidifying coils; fluid flow through flexible orifices; degradation of mylar film exposed to water and alcohol; refrigerating capacity and performance data for various refrigerants, azeotropes and mixtures; graphical solution for flows in hydraulic circuits; solar heat gains through domed skylights; evaluation procedure for odor-control methods; and infiltration through revolving doors.

The symposiums will cover industrial ventilation, food refrigeration, air conditioning and domestic refrigerator engineering.

Victor J. Johnson of the National Bureau of Standards, Boulder, Colo., and a member of Ashrae's Rocky Mountain Chapter, is general chairman of the Host Committee.

WITH THE ENGINEERS

KOEGEL, BAKER AND HAGGARD, consulting mechanical and electrical engineers, have moved to Suite 410, 4447 North Central Expressway, Dallas 5, Texas . . .

BURNS & MCDONNELL ENGINEERING COMPANY, Kansas City, Mo., consulting engineers, have ad-

mitted the following former staff members to partnership in the firm: Leo L. Cummingham, civil engineer; Jasper W. Meals, civil engineer; Alwin H. Rector, electrical engineer; William W. Rumans, electrical engineer; Edwin J. Runyan, civil engineer. Founded in 1898, the company is completing its sixty-third year of consulting service in the fields of water supply and treatment, sewerage, electric power, airports, appraisals, and special services . . .

LIMBACH COMPANY has named E. Frank Morgan, Jr., as purchasing manager of its mechanical department in the Cincinnati office. He will assume purchasing management of the company's mechanical construction projects in Ohio, Kentucky and Indiana. William J. Parker, Jr., has been appointed for a similar role in the Boston office. He will direct all purchasing for plumbing, heating, air conditioning and ventilating projects . . .

Appointment of Dr. Leslie Silverman as head of the Department of Industrial Hygiene, Harvard School of Public Health, was announced. He is professor of engineering in environmental hygiene and well known for his basic and applied research on control measures for industrial air pollution.

INSTITUTIONS AND ASSOCIATIONS

MODINE MFG. CO., Racine, Wis., has become a member of Commercial and Industrial Div., NATIONAL BETTER HEATING-COOLING COUNCIL, New York, N. Y. The Council, the hydronic industry's marketing-promotion arm, is backed by manufacturers as well as Central Supply Association, Mechanical Contractors Association of America, National Association of Plumbing Contractors and the United Association . . .

Name of the new national oil heat association, result of the merger of Oil-Heat Institute of America and National Fueloil

Just How Clean is clean Air

How clean must the air be in Commercial and Industrial Air Conditioning Systems

How can the specific clean air requirements be achieved in–

Hospital Operating Rooms
Computer Ventilating Systems
Process Exhaust Systems
"Dust-Free" Rooms

. . . and what is the POSITIVE, low-maintenance way to get it

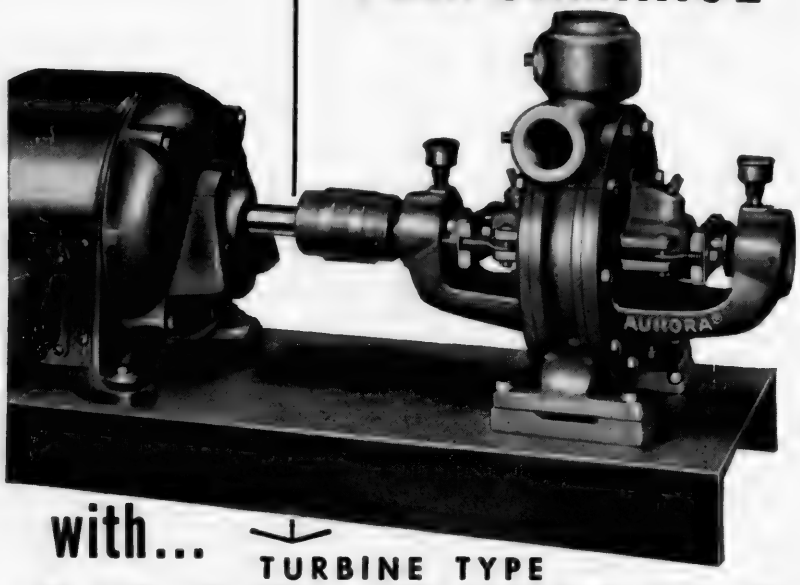
YOU'LL FIND MANY HELPFUL SUGGESTIONS IN BULLETIN 121

Write Today for Your FREE Copy . . .

Cambridge® Filter Corporation
734 E. Erie Blvd., Syracuse 1, N. Y.

REPRESENTATIVES IN PRINCIPAL CITIES

Profit by... CONTROLLED PERFORMANCE



with... TURBINE TYPE

APCO PUMPS

- PROVEN DEPENDABILITY
- CALCULATED CAPACITIES
- RUGGED CONSTRUCTION
- HIGHEST QUALITY CONTROL
- APPLICATION ANALYSIS
- SELECTED COMPONENTS
- MINIMIZED WEAR
- SERVICE FLEXIBILITY
- PRESSURES TO 400 P.S.I.
- CAPACITIES TO 150 G.P.M.

Ruggedness of construction and simplicity of design of APCO turbine type pumps combine to provide longer life, high efficiency, and minimized down time. This means more for your "pump operating dollar." With APCO *steep impeller* characteristics there is little capacity change under fluctuating head conditions. Select from the "1001" types, sizes, and capacities of AURORA pumps to obtain *the one* specifically designed to fit your needs.

APCO turbine type pumps are most frequently used for: Boiler Feed, Condensate Return, Fresh Water Service, Brine Service, Ice Water Circulation, Filter Service, LPG Service, Transfer Service, Caustic Liquid Handling, Sprinkler Service, Spraying Service, Water Treatment, Booster Service, and High Temperature Service.

WRITE TODAY FOR NEW BULLETIN S-111

AURORA Always PUMPS

AURORA PUMP DIVISION
THE NEW YORK AIR BRAKE COMPANY
690 LOUCKS STREET • AURORA • ILLINOIS

LOCAL DISTRIBUTOR IS LISTED IN THE YELLOW PAGES OF YOUR PHONE BOOK

Briefly Stated

Council, is NATIONAL OIL FUEL INSTITUTE. Their new address is Lincoln Building, 60 East 42nd Street, New York, N. Y. . . .

John T. McCann has been named executive vice-president of MECHANICAL CONTRACTORS ASSOCIATION OF AMERICA, INC., New York, N. Y. He was formerly director of industrial relations for General Bronze Corporation . . .

An intensive campaign aimed at educating school boards, architects, consulting engineers, and the general public regarding the advantages of air conditioning new schools has been launched in the Southern California area by CERTIFIED REFRIGERATION AND AIR CONDITIONING FOUNDATION (CRAC). Objective of the campaign is focused on the secondary school level. Spearheading the drive is a special committee of members of Refrigeration and Air Conditioning Contractors Association of Southern California . . .

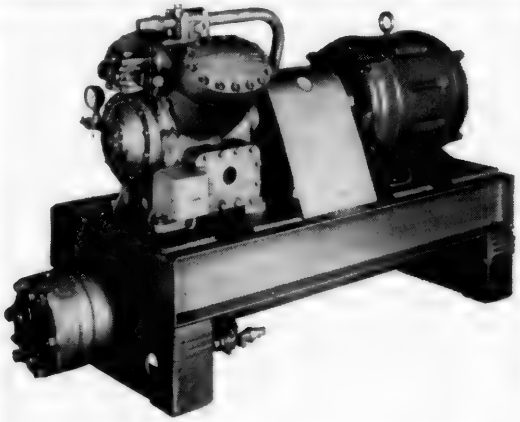
Emil T. Johnson, vice-president of Union Asbestos and Rubber Company, has been elected president of NATIONAL INSULATION MANUFACTURERS ASSOCIATION, New York, N. Y. M. W. Burleson, vice-president of Johns-Manville Sales Corporation, is the new vice-president of NIMA . . .

M. Clare Miller, San Ore Construction Co., McPherson, Kansas, was installed as president of THE ASSOCIATED GENERAL CONTRACTORS OF AMERICA, INC. at the closing session of The Association's 42nd Annual Convention in Boston, Mass. . . .

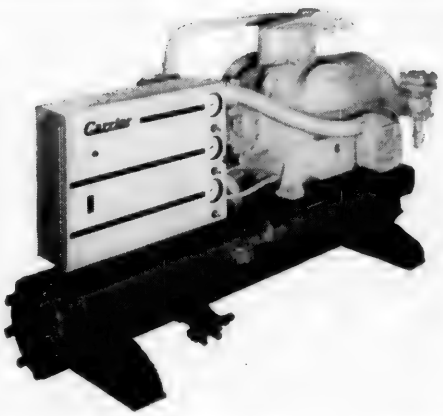
BURGEONING BUSINESS

DRAYER-HANSON DIVISION, HI-PRESS AIR CONDITIONING OF AMERICA, INC., has established an Eastern distribution center at 11-12 44th Avenue, Long Island City, N.Y. The new facility will ultimately stock pile complete lines of commercial refrigeration equipment. Also, assembly work will be conducted there to modify prod-

Now Carrier has a complete line of Hermetic and Customized Condensing Units ranging from 5 to 240 tons



5FH Customized Condensing Units—5 to 240 tons. These units make it possible for you to buy a "tailor-made" machine that's exactly right for the job, no matter how strict the specifications or different the power source. Rather than assemble and ship units complete from the factory, Carrier provides a practical "building block" plan for easy combination of components on the job—no special tools needed. Compressor, base, coupling, motor and condenser are individually selected for each installation—with more than 1000 combinations possible. Main components, crated separately, fit through small openings, go into most elevators. Capacities above 120 tons are duplex units. All unit fittings included.



6G, 6L Hermetic Condensing Units—[illegible] to 120 tons. Completely factory-assembled for both air conditioning and refrigeration installations at low first cost. Units consist of compressor, motor, water-cooled condenser, safety controls and motor starting and protection equipment. If desired, machines may be ordered without water-cooled condenser for use with evaporative or air-cooled condensers. Their modern hermetic compressors eliminate problems of motor mounting, coupling alignment and shaft seal maintenance. Since these Carrier Condensing Units arrive on the job site ready for installation, they save not only the time but also the expense involved in engineering, assembling and wiring in the field.

For complete information about the complete Carrier line of Hermetic and Customized Condensing Units, call your Carrier distributor, listed in the Yellow Pages. Or write Carrier Air Conditioning Company, Syracuse 1, New York.

Carrier Air Conditioning Company

ucts to specific customer specifications . . .

MIDWEST PIPING COMPANY, INC. has become a division of CRANE COMPANY, Chicago, Ill. Plans are to continue the present management and sales policy under the direction of Midwest president O. P. Carter. The company will be known as Midwest Piping Div., Crane Company . . .

MODINE MFG. CO., Racine, Wisc., will build a 30,000 sq ft production plant at McHenry, Ill. The building is expected to be ready for occupancy in the fall . . .

JOHNS-MANVILLE CORPORATION will establish new business offices in each of twelve key areas throughout the nation. The company states that reports from the field indicate that pent-up requirements for pipe for all uses by governmental agencies and industries should be translated into an upsurge in orders and increased employment in the pipe industry . . .

WHITE-ROGERS CO., St. Louis, Mo., acquired the assets of SIGNET CONTROLS DIV., IRON FIREMAN MANUFACTURING CO. Heating Division of Iron Fireman has been the major customer for Signet Controls. Assets purchased from Signet will be moved and integrated into White-Rogers' newly-constructed plant in St. Louis where the manufacture of the popular T600 thermostats and heating-cooling sub-bases is to be continued . . .

MONTGOMERY-WARD & CO., Chicago, Ill., is establishing a new sales department to negotiate contracts for merchandise, supplies and equipment for contractors, builders, large business firms, public and private institutions and government agencies. The program is being introduced initially through fifty-seven of the company's large retail stores . . .

BAYLEY BLOWER CO., Milwaukee, Wis., has been purchased from Green Fuel Economizer Co., Beacon, N. Y. by a group of local Bayley executives. The new corporate officers are Vance Smith, president; Paul D. Persinger, vice-president; and Walter S. Davis, secretary. Bayley is one of the oldest manufacturers in the heating, air conditioning and ventilating field. In the past thirty years they have specialized in commercial and industrial centrifugal fans. Bayley's operations will continue as before, except that functions formerly performed in New York will be brought in to Milwaukee as soon as posible . . .

A new company to assemble and manufacture industrial air conditioning equipment in Nigeria has been formed by Messrs. G. L. Gaiser (Nigeria) Ltd., and a New York firm, J. E. Schector Corporation. The new company will be known as MECHANICAL CONTRACTORS (W. A.) LTD. It will also undertake industrial air conditioning, plumbing, process piping, electric lighting, and power insulation, sheet metal fabrication and installation, industrial refrigeration, and ventilation . . .

NEW REPRESENTATIVES

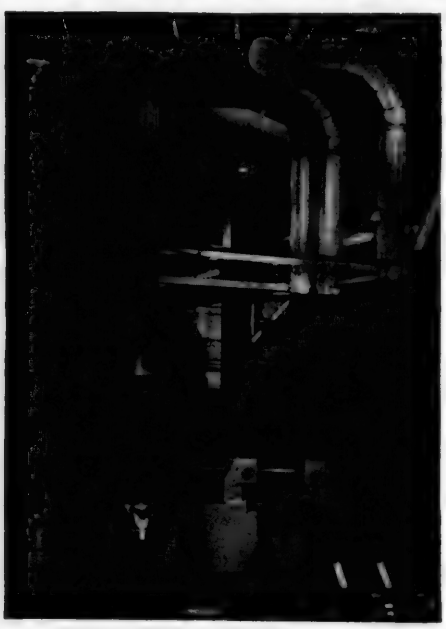
THE TRANE CO., La Crosse, Wis., has opened a Rochester, Minn. sales office. Gary W. Bubeck has been named sales engineer in charge . . .

Rolf Klippert has been named to represent BUFFALO FORGE COMPANY in the Tampa, Fla. sales district for Air Handling and Centrifugal Pumps Division . . .

THE ROBERT B. DARLING COMPANY of New York City has become a BARBER-COLMAN AUTOMATIC CONTROL AND AIR DISTRIBUTION branch office. The company has operated as a distributor since 1942 . . .

John J. Floreth, vice-president and manager of service for YORK DIV., BORG-WARNER CORPORATION, has resigned his position with the company but will maintain his association with York in the capacity of sales agent for the Florida area. He will open an office in the Fort Lauderdale vicinity under

YOU SAVE MORE WITH FLEXAUST® HOSE



Thousands of successful installations prove that use of Flexaust hose and Portovent retractable duct with metal duct systems lower installation costs — but there are other important advantages

Exceptional abrasion resistance
Corrosion resistance
Noise absorption
Durability under heavy flexing
Provision for expansion and contraction
Easy relocation of hoods and machines

Made of high quality neoprene coated fabrics 1¼ to 36" i.d.

Write today for full details
Distributors in all principal cities

THE FLEXAUST CO.

DEPT. HV-5 100 PARK AVE.
NEW YORK 17, N. Y.

When buying ART...

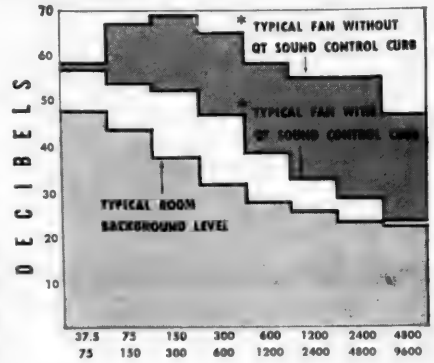
or selecting a SOUND CONTROL CURB it pays to be SURE!

1. **Be sure that performance data has been authenticated**
2. **Be sure that the design is original and not bootlegged**
3. **Be sure that you are not accepting a hastily copied, low quality substitute**
4. **Be sure that rights to produce and use are clearly established by patent and copyright laws**

The famous admonition, *caveat emptor* ("let the buyer beware"), is well worth calling to mind when it comes to selecting a sound attenuating curb for your power exhausters. Since performance cannot be judged visually, extreme caution is your best insurance against disappointing results.

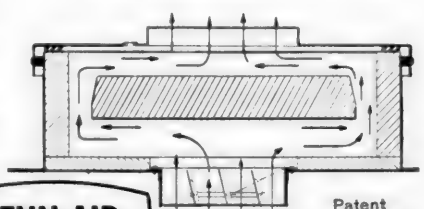
Consider these facts: Jenn-Air's QT Sound Control Curb is the first curb that *effectively* reduces fan noise. This major breakthrough in design provides twice as much attenuation as any previous so-called sound curb. The QT Sound Control Curb reduces exhauster sound power at inlet by 90% . . . with only a 10% loss in air moving capacity! These are actual performance figures—verified by independent laboratory tests.

Get all the facts before you specify—you'll find the Jenn-Air QT Sound Control Curb to be the genuine article. Write for Bulletin 601-SC.



*MODEL 100 CR, ⅓ HP, 1725 RPM MOTOR

EXCLUSIVE JENN-AIR DESIGN
Cross Section QT Sound Control Curb



Patent Pending

JENN-AIR QT SOUND CONTROL CURB

JENN-AIR PRODUCTS COMPANY, INC. • 1102 STADIUM DRIVE • INDIANAPOLIS 7, INDIANA

INCREASE EFFICIENCY AND DECREASE COSTS WITH METROPOLITAN MAINTENANCE PRODUCTS

DUBOTH®
BOILER FEED WATER TREATMENTS

VAPORENE®
AIR CONDITIONING WATER TREATMENTS

SLUDGOUT®
FUEL OIL ADDITIVE FORMULATIONS

SOOTRACIDE®
SOOT AND SLAG ELIMINATOR

EZ TREAT®
COMPLETE TREATMENT FOR SMALL AIR CONDITIONING

DESCALER®
AIR CONDITIONING AND BOILER SCALE REMOVERS

CORRODINE®
STEAM & RETURN LINE TREATMENT

CORRODICIDE®
TREATMENT FOR GENERAL WATER SUPPLY SYSTEMS

As They Have For 40 Years, Engineers Everywhere Today Rely On METROPOLITAN'S Quality Chemical Maintenance Products And Consulting Services.

Through Scientific Field Surveys And Laboratory Analyses METROPOLITAN Works Closely With You To Find The Right Answers To Your Specific Problems.

To Prevent Or Eliminate Problems Of Scale, Corrosion, Slime, Soot, Slag, Sludge Caused By Impurities In Water And Fuels . . . In Boilers, Cooling Towers, Evaporative Condensers, Storage Tanks, Steam & Return Lines, General Water Supply Systems . . . In Industrial Plants, Office Buildings, Apartment Houses, Public Institutions, Hotels, Theaters, Stores . . .

ASK FOR THE MAN FROM METROPOLITAN. HE HAS THE CHEMICAL SOLUTION FOR YOU.

See our Representative in your area or write us for complete information.

METROPOLITAN REFINING CO., INC.
50-23 TWENTY-THIRD STREET
LONG ISLAND CITY 1, N.Y.

Briefly Stated

the name of J. J. FLORETH & ASSOCIATES, INC. . . .

MODINE MANUFACTURING COMPANY, Racine, Wis., has announced the appointment in Cleveland, Ohio, and Buffalo, N. Y., of Ohio Hydronics, Inc., formerly known as Rock & Donelson, to handle its heating and air conditioning product lines in Cleveland and northeastern Ohio, and Alling Equipment Company, operated by Tom Hollander, for the Buffalo territory. In addition, the sales organization in Ohio has been expanded by making Dayton a separate territory rather than a subagency of the Columbus representative. The firm of Weber-Durbin-Stoermer, Inc., will represent Modine there. . .

CARRIER AIR CONDITIONING COMPANY announced it has extended the franchise of its Philadelphia distributor, Peirce-Phelps, Inc., to include South and Central New Jersey and the Harrisburg, Pa., area. Also, Power Engineering Corp., Wilkes-Barre, Pa., now serves 46 counties between Pendleton County, W. Va., and Ithaca, N. Y. Finally, Wilson Electric Co., Rockford, Ill., now serves 52 counties in Illinois, Iowa, Wisconsin, and Missouri. . .

Air Conditioning Wholesalers, Inc., 900 Jefferson Rd., Rochester, N. Y., has been appointed distributors for western New York State by TYPHOON AIR CONDITIONING DIVISION, HUPP CORPORATION.

Mississippi has joined the network of DRAYER-HANSON DIV., Hi-Press Air Conditioning of America, Inc., with the appointment of a leading Jackson, Miss. firm, A-T-M Equipment Company, Inc. Also announced was appointment of Sam Wallens Co., West Springfield, Ill., for southern Massachusetts and for northern Connecticut. . .

ZURN INDUSTRIES, INC., Erie, Pa., (pipeline strainers and re-

(Continued on page 136)

IMPORTANT ANNOUNCEMENT

to people who hear voices*

*voices that intrude or disrupt and noises that project when they should be hushed

The new Aircoustat® Model W Return Air-Vent Silencers stop the transmission of noise without blocking air flow

Aircoustat Return Air-Vent Silencers eliminate the distracting sound of voices that spill from one area to another. Their slim design gives you a choice of installation. You can install them within a wall or ceiling or hang them on doors or walls. Let Koppers long experience in sound control help you. Write today for information to: KOPPERS COMPANY, INC., 2905 Scott Street, Baltimore 3, Maryland.

Model W Return Air-Vent Silencer

In sizes for all applications:

Model	Thickness	Width	Length
W-1	3½″	30″	48″
W-2	3½″	42″	48″
W-3	5″	30″	48″
W-4	5″	42″	48″
W-5	7″	30″	48″
W-6	7″	42″	48″

KOPPERS

SOUND CONTROL
METAL PRODUCTS DIVISION
® *Engineered* Products Sold with *Service*

Why take less . . . when CORDLEY offers *more:*

More Cooler Experience. Water Coolers are Cordley's *only* business, not a side line.

More Assurance of Satisfaction. Cordley's full 5-year guaranty is by far the strongest in the industry.

More Help in choosing the right coolers for your use...from Cordley's line of 28 job-rated models. 4439

The New CORDWALL LINE

No plumbing shows. Flush to the wall. No dirt can get behind. 3 wall models for installation at any height. 5 floor models. See Yellow Pages for nearest Cordley Distributor. Ask for Catalog 61.

CORDLEY & HAYES
Specialists in water cooling since 1889
443 Park Avenue South, New York 16, N.Y.

DEGREE-DAYS FOR MARCH, 1961

(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city

AIR CONDITIONING, HEATING AND VENTILATING's 33rd Year of Publication of Monthly Degree-Day Data

City	March			Season to Mar. 31, from Sept. 1		
	1961	1960	Normal	1961	1960	Normal
Abilene, Tex. (A)	246	482	344	2526	2927	2594
Albany, N. Y. (A)	987	1184	989	6232	5993	6045
Albuquerque, N. M. (A)	551	462	589	3948	3993	4030
Alpena, Mich. (C)	1116	1471	1156	6961	7223	6604
Anchorage, Alaska (A)	(a)	1357	1575	(a)	8265	8434
Asheville, N. C. (C)	453	969	572	3685	4140	3677
Atlanta, Ga. (A)	322	713	404	2750	3059	2673
Atlantic City, N. J. (C)	906	988	729	4619	4206	4060
Augusta, Ga. (A)	221	637	308	2453	2717	2076
Baltimore, Md. (C)	559	900	611	3925	3982	3804
Billings, Mont. (A)	738	925	958	4950	6128	6091
Binghamton, N. Y. (C)	913	1246	927	5867	5406	5662
Birmingham, Ala. (A)	252	637	378	2575	2924	2630
Bismarck, N. D. (A)	892	1390	1187	6955	7993	7839
Block Island, R. I. (A)	880	1001	865	4895	4593	4782
Boise, Ida. (A)	634	681	719	4500	5577	5096
Boston, Mass. (A)	865	992	849	5059	4789	4972
Buffalo, N. Y. (A)	952	1258	992	5979	5821	5769
Burlington, Ia. (A)	742	1287	822	5203	6104	5463
Burlington, Vt. (A)	1187	1267	1107	7173	6724	6739
Cairo, Ill. (C)	417	911	523	3587	4099	3527
Charleston, S. C. (C)	143	554	260	1867	2146	1726
Charlotte, N. C. (A)	383	776	449	3034	3316	3004
Chattanooga, Tenn. (A)	373	801	467	3307	3595	3160
Cheyenne, Wyo. (A)	1028	975	1029	5784	6390	6138
Chicago, Ill. (A)	741	1192	868	5087	5766	5516
Cincinnati, O. (C)	510	1001	645	3977	4443	4110
Cleveland, O. (A)	771	1262	874	5501	5413	5196
Columbia, Mo. (A)	610	1118	698	4287	5227	4632
Columbia, S. C. (A)	238	655	318	2508	2814	2207
Columbus, O. (C)	618	1109	741	4702	5001	4694
Concord, N. H. (A)	1002	1150	1029	6533	6016	6486
Concordia, Kans. (C)	684	1143	725	4488	5704	4816
Dallas, Tex. (A)	193	488	288	2204	2709	2197
Denver, Colo. (A)	804	827	843	5090	5537	5240
Des Moines, Ia. (A)	845	1344	868	5481	6605	5745
Detroit, Mich. (A)	795	1196	927	5321	5665	5527
Devils Lake, N. D. (C)	1084	1588	1314	7934	9075	8551
Dodge City, Kans. (A)	658	953	694	4254	5269	4561
Dubuque, Ia. (A)	932	1390	983	6103	6970	6349
Duluth, Minn. (A)	1100	1475	1252	7660	8407	7929
El Paso, Tex. (A)	266	176	330	2723	2446	2531
Ely, Nev. (A)	953	792	921	5825	6446	6120
Escanaba, Mich. (C)	1083	1385	1203	6752	7057	7059
Evansville, Ind. (A)	472	1074	589	4147	4695	4013
Fairbanks, Alaska (A)	(a)	1885	1736	(a)	11783	11891
Fargo, N. D. (A)	936	1526	1231	7539	8342	8082
Fort Smith, Ark. (A)	345	719	418	3089	3636	3037
Fort Wayne, Ind. (A)	733	1253	874	5379	5817	5475
Fort Worth, Tex. (A)	209	499	308	2314	2769	2266
Fresno, California (A)	352	255	304	2561	2177	2344
Galveston, Tex. (C)	51	264	176	1231	1559	1181
Grand Junction, Colo. (A)	696	697	738	4697	5238	5226
Grand Rapids, Mich. (A)	841	1268	1008	5657	6125	6041
Green Bay, Wisc. (A)	991	1405	1132	6598	7180	7019
Greensboro, N. C. (A)	444	919	528	3602	3959	3519
Greenville, S. C. (A)	314	763	442	2832	3325	2867
Harrisburg, Pa. (A)	720	1017	750	4962	4780	4693
Hartford, Conn. (A)	882	1056	871	5619	5311	5365
Havre, Mont. (A)	857	1139	1076	6058	7128	7120
Helena, Mont. (A)	863	996	1017	5824	7044	6952
Houston, Tex. (C)	59	248	166	1285	1648	1249
Huron, S. D. (A)	879	1546	1032	7103	7868	6959
Indianapolis, Ind. (A)	657	1198	772	5056	5480	4973
Jackson, Miss. (A)	169	550	299	2226	2755	2121
Juneau, Alaska (A)	(a)	1019	998	(a)	6078	6569
Kansas City, Mo. (A)	649	1067	666	4168	5037	4477
Knoxville, Tenn. (A)	400	869	500	3398	3761	3344
La Crosse, Wisc. (A)	951	1322	1035	6221	6860	6743
Lander, Wyo. (A)	887	982	1045	6329	7026	7027
Lewiston, Me. (O)	1023	1117	1093	6479	5961	6625
Lincoln, Nebr. (C)	769	1236	794	4965	6198	5277

a) Data not available.
* Includes July and August.
** Figures based on City office readings.

Normal figures in this table are based on 30-year period covering 1921 to 1950, inclusive, as compiled and published by the U. S. Weather Bureau.

Figures in this table, with two exceptions, based on local weather bureau reports. Exceptions are Utica and Lewiston, figures for which are furnished through the courtesy of Coke Sales Department, Central New York Power Co., Utica, N. Y., and Norman E. Ross, Bursar, Bates College, Lewiston, Me., respectively.

Degree-Days for March, 1961 (Concluded)

(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city

AIR CONDITIONING, HEATING AND VENTILATING's 33rd Year of Publication of Monthly Degree-Day Data

City	March			Season to Mar. 31, from Sept. 1		
	1961	1960	Normal	1961	1960	Normal
Little Rock, Ark. (A)	295	729	401	3044	3396	2842
Los Angeles, Calif. (C)	146	111	212	724	824	1235
Louisville, Ky. (A)	536	1002	611	4296	4394	4055
Lynchburg, Va. (A)	489	933	584	3911	4164	3777
Macon, Ga. (A)	202	576	275	2198	2485	1987
Madison, Wisc. (A)	959	1440	1011	6256	6978	6342
Marquette, Mich. (C)	1060	1353	1181	6663	7083	6918
Memphis, Tenn. (A)	311	763	427	3011	3429	2974
Meridian, Miss. (A)	202	534	309	2319	2748	2239
Milwaukee, Wisc. (A)	917	1342	983	6016	6505	6072
Minneapolis, Minn. (A)	1013	1395	1057	6976	7266	6919
Moline, Ill. (A)	789	1392	862	5481	6328	5659
Montgomery, Ala. (A)	206	497	288	2265	2411	2057
Nashville, Tenn. (A)	393	886	498	3459	3931	3284
New Haven, Conn. (A)	854	1027	865	5240	4897	5128
New Orleans, La. (C)	48	264	163	1142	1542	1156
New York (Central Park)	719	(a)	747*	4396*	4368*	4393*
New York (International A)	760	(a)	(a)	4493	(a)	(a)
New York (La Guardia A)	739	(a)	760*	4345*	4391*	135*
Newark, N. J. (A)	729	959	760	4653	4408	4643
Norfolk, Va. (A)	385	796	500	3285	3376	3130
North Platte, Nebr. (A)	833	1143	887	5448	6679	5738
Oak Ridge, Tenn. (C)	400	895	633	3516	3863	3743
Oakland, Calif. (A)	365	282	360	2306	1959	2389
Oklahoma City, Okla. (A)	395	777	472	3255	4048	3312
Omaha, Nebr. (A)	784	1290	831	5130	6398	5559
Parkersburg, W. Va. (C)	531	1038	672	4264	4663	4271
Peoria, Ill. (A)	750	1308	828	5420	6033	5408
Philadelphia, Pa. (C)	642	922	667	4100	4107	4061
Phoenix, Ariz. (A)	166	56	175	1364	1437	1430
Pittsburgh, Pa. (C)	638	1066	735	4573	4719	4496
Pittsfield, Mass. (A)	1040	1274	1060	6501	6327	6475
Portland, Me. (A)	1075	1159	1039	6573	6051	6406
Portland, Ore. (C)	509	554	515	3113	3577	3500
Providence, R. I. (A)	864	1034	874	5324	5042	5213
Pueblo, Colo. (A)	721	817	775	4722	5578	5023
Raleigh, N. C. (A)	391	845	440	3305	3622	2874
Rapid City, S. D. (A)	787	1140	1045	5461	6677	6359
Reading, Pa. (C)	702	985	725	4716	4545	4510
Red Bluff, Calif. (A)	418	297	336	2415	2175	2318
Reno, Nev. (A)	721	638	756	4747	5107	4946
Richmond, Va. (A)	461	894	550	3720	3939	3618
Rochester, N. Y. (A)	945	1313	992	5862	6070	5862
Roswel, N. M. (A)	463	426	443	3829	3480	3211
Sacramento, Calif. (C)	334	246	317	2328	2098	2314
St. Joseph, Mo. (C)	707	1216	648	4693	5702	4294
St. Louis, Mo. (C)	522	1027	620	3916	4691	4098
Salt Lake City, Ut. (A)	676	692	741	4789	5501	5099
San Antonio, Tex. (A)	82	291	190	1489	1926	1545
San Diego, Calif. (A)	182	151	223	893	872	1265
Sandusky, O. (C)	732	1183	853	5082	5435	5088
San Francisco, Calif. (C)	327	282	317	2076	1611	1996
Sault Ste. Marie, Mich. (A)	1183	1442	1302	7354	7578	7671
Savannah, Ga. (A)	119	535	238	3576	2203	1667
Scranton, Pa. (A)	922	1225	859	5918	5646	5282
Seattle, Wash. (C)	525	575	558	3251	3553	3595
Sheridan, Wyo. (A)	832	977	1035	5703	6785	6642
Shreveport, La. (A)	167	511	272	2088	2682	2056
Sioux City, Ia. (A)	843	1454	930	5818	7091	6231
Spokane, Wash. (A)	771	823	834	5341	6189	5770
Springfield, Ill. (A)	650	1257	713	4899	5574	4734
Springfield, Mo. (A)	544	1002	632	4047	4781	4256
Syracuse, N. Y. (A)	977	1254	955	5941	5930	5637
Toledo, O. (A)	795	1211	905	4599	5852	5522
Topeka, Kans. (C)	676	1145	669	4505	5500	4499
Trenton, N. J. (C)	719	983	735	4646	4480	4495
Tulsa, Okla. (A)	404	808	485	3261	3946	3367
Utica, N. Y. (O)	900	1181	989	5252	5557	5955
Valentine, Nebr. (A)	873	1243	970	5853	7092	6140
Walla Walla, Wash. (C)	511	592	564	3811	4614	4301
Washington, D. C. (A)	536	905	606	4113	3990	3864
Wichita, Kans. (A)	562	962	619	3318	4896	4183
Williston, N. D. (C)	917	1342	1194	6799	8050	7836
Winnemucca, Nev. (A)	787	694	794	4037	5729	5396
Yakima, Wash. (A)	676	730	660	4884	5461	5172

For footnotes, see page 134.

ANNOUNCING MACHINE-FORMED FITTINGS for HIGH VELOCITY air systems

- LOWER COST
- EASIER INSTALLATION
- GUARANTEED QUALITY

UP TO 50% COST REDUCTION

United's new mass-produced machine-made fittings can reduce fitting costs up to 50% . . . and provide the air movement industry with a standardized fitting having uniformity of performance, factory controlled quality and dimensions. Please note — these fittings are specifically sized to fit United Spiral "Lockseam" pipe. Contact your local United representative for complete information.

spiral pipe division
United
SHEET METAL COMPANY INC
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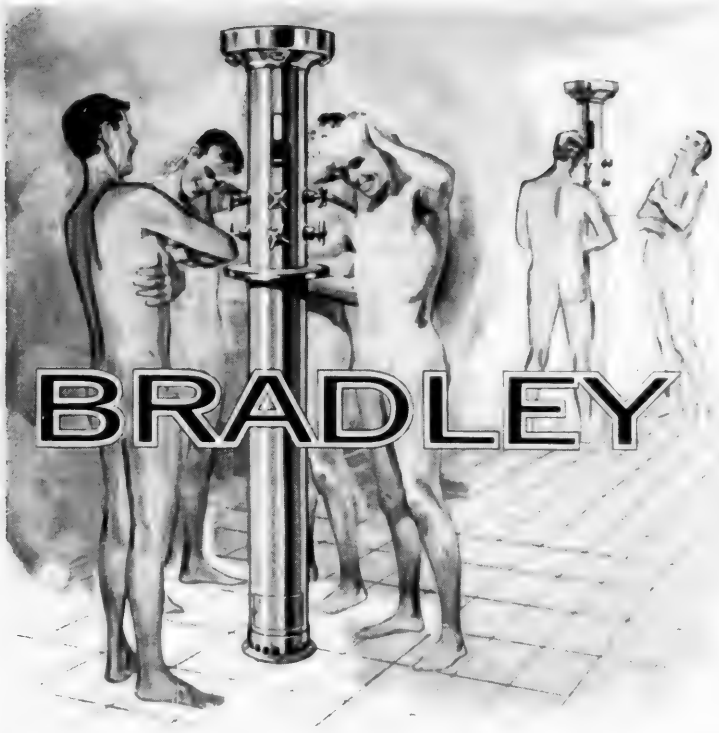


Most Complete Line of Group Showers

Save space, water, installation costs, and maintenance time. Speed traffic flow, too! And look at the variety you can choose from: 2, 3, and 5-person Column showers | 5-person Multi-Stall shower | 3-person Semi-Circular Multi-Stall shower | 2-person Corner shower | 2 or 3-person Wall-Mounted showers | Custom Panel showers.

Circular, semi-circular, and Duo Washfountains serving as many as 8 persons simultaneously.

Column, partition, and wall-mounted showers serving as many as 5 persons simultaneously.

Bradley Washfountains and showers provide group facilities for as many as 8 and 5 persons, respectively, in schools and in commercial, industrial, and public buildings. For additional information, contact your Bradley representative. Or write for Catalog No. 6004. Bradley Washfountain Co., 2255 West Michigan St., Milwaukee 1, Wisconsin.

61-116

Briefly Stated

(Continued from page 132)

lated fluid handling devices) announces appointment of Hako-Hearn Engineers as sales engineers in the Tulsa, Okla., area for the company's Fluid Control Division. . .

JAY R. SMITH CO., Union, N. J., announced the following appointments: Tennessee Sales & Service, Knoxville, Tenn.; and Hicks and Theisen, Inc., Milwaukee, Wis., as sales representatives for the company's lines of plumbing products. . . .

The Connecticut Air Condition-Company, 543 Orange Avenue, West Haven, Connecticut, a distributor for CARRIER AIR CONDITIONING COMPANY, has been assigned additional trading territory in Massachusetts and its home state. Its franchise has been expanded to include Franklin, Hampden and Hampshire Counties, Massachusetts and New London County, Connecticut. The combined population of this new area is about 715,000. The addition of New London gives the firm the entire state of Connecticut. Lutz Engineering Company, former New London distributor, will remain in the contracting business as a Carrier dealer . . .

Two new sales representatives in Buffalo, N. Y., and Phoenix, Ariz., have been named for HALSTEAD & MITCHELL COMPANY, Pittsburgh. The new representatives are William F. Albern, Buffalo, and George L. Jackson Company, Phoenix. Both will handle sales of air handlers, condensers, cooling towers, refrigeration and air conditioning systems in their respective areas . . .

J. A. Walsh & Co. has been appointed exclusive distributor for air conditioning and heat pump products of TYPHOON AIR CONDITIONING AND TYPHOON HEAT PUMP DIVISIONS, HUPP CORPORATION. J. A. Walsh & Co., founded in 1936, is headed by James A. Walsh. William Boland, formerly district sales manager for Typhoon

AGITAIR® Decoraire

EXTRUDED ALUMINUM
REGISTERS . . . GRILLES

FOR SHEER ARCHITECTURAL BEAUTY AND EFFICIENCY

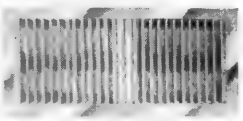
Whether you use one foot of DECORAIRE or a thousand foot run or more, you can be sure that these extruded aluminum grilles or registers will give maximum performance to assure complete users satisfaction.

DECORAIRE incorporates desirable practical features . . . APPEARANCE . . . PERFORMANCE . . . VERSATILITY to meet the exacting requirements of architects, engineers and contractors.

ALSO A COMPLETE LINE OF REGISTERS – GRILLES

REGISTERS

SIGHT TIGHT GRILLES



GRILLES

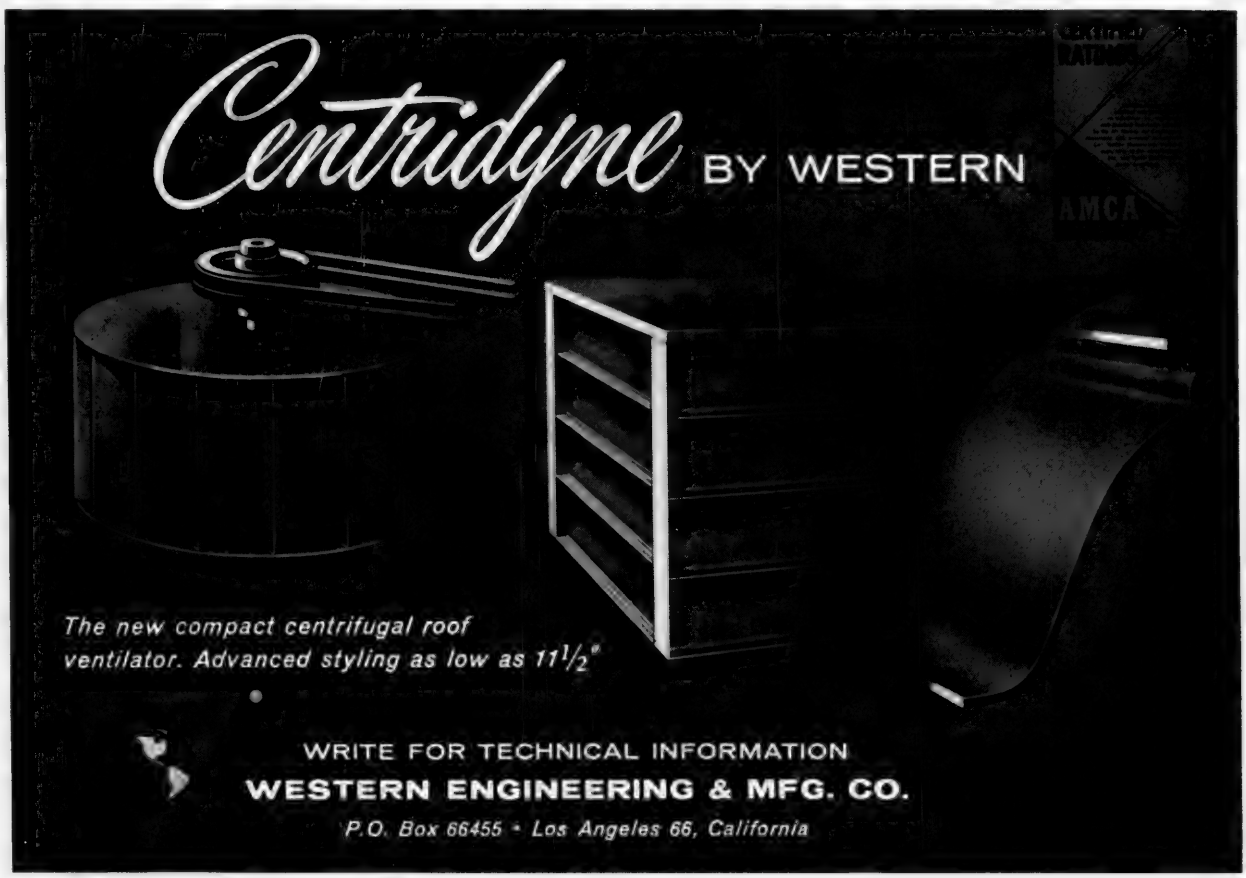
To meet every requirement of the architect and designer, there is also available AGITAIR Registers and Grilles in a wide range of sizes and styles.

Ask for catalog R-G-100.

AIR DEVICES INC., 185 MADISON AVE., NEW YORK 16, N. Y.

BETTER PRODUCTS FOR AIR DISTRIBUTION • AIR CLEANING • AIR EXHAUST

Centridyne BY WESTERN



The new compact centrifugal roof ventilator. Advanced styling as low as 11½"

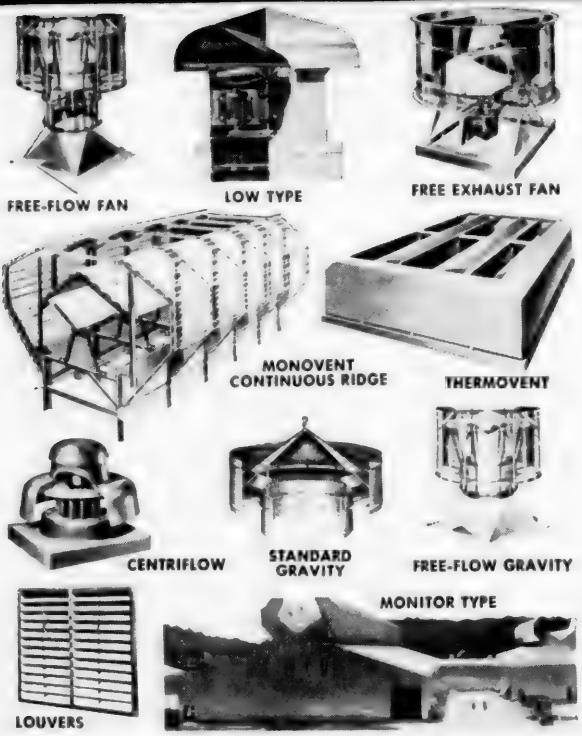
WRITE FOR TECHNICAL INFORMATION

WESTERN ENGINEERING & MFG. CO.

P.O. Box 66455 • Los Angeles 66, California

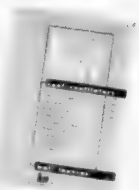
Burt

ROOF VENTILATORS
WALL LOUVERS



SEND FOR FREE DATA BOOK

BURT'S complete ventilator line includes a type and size to put air to work most efficiently and economically for your specialized needs. BURT'S engineering skill and know-how from more than half a century designing and building ventilators is your assurance of satisfaction. Your inquiry will receive prompt and qualified attention.



FAN & GRAVITY VENTILATORS LOUVERS • SHEET METAL SPECIALTIES

The Burt Manufacturing Company

49 E. South St., Akron 11, Ohio

MEMBER POWER FAN MANUFACTURERS ASSOCIATION

in the Houston area, will head the wholesale company's air conditioning division. The Houston distributor also handles RCA Whirlpool appliances and the residential air conditioning, furnace and air-cooled heat pump products of Hupp Corporation's Perfection Division.

PERSONNEL ITEMS

Appointment of Willard B. Buck as sales manager, air conditioning, has been announced by DANVILLE (ILLINOIS) DIVISION, BOHN ALUMINUM AND BRASS CORPORATION. . .

Joseph D. Loveley has been appointed coordinator of manufacturing and engineering for COPELAND REFRIGERATION CORP., Sidney, Ohio. He was formerly with Chrysler Corporation . . .

Richard E. Sorenson is appointed field sales manager for MCQUAY, INC., Minneapolis, Minn. . . .

Appointments of R. David Kishbauch as sales manager, and John P. Farrell as products manager, AMERICAN-STANDARD AIR CONDITIONING DIVISION, New York, N. Y., have been announced by the company . . .

William C. French, Jr. has been appointed general manager of sales for U. S. STEEL'S NATIONAL TUBE DIVISION. He succeeds Louis W. Mason who is retiring after more than thirty-seven years of service . . .

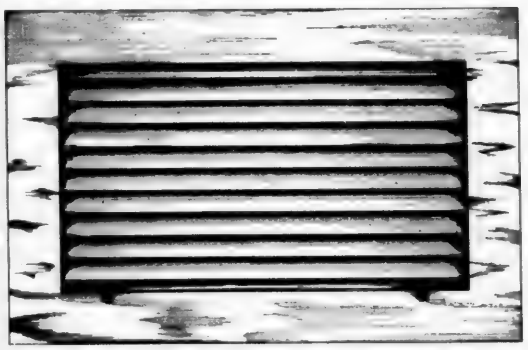
Leslie E. Howell has been named executive vice-president of JENN-AIR PRODUCTS CO., INC., Indianapolis, Ind. He was also re-elected to the company's board of directors, it was announced . . .

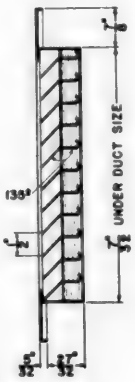
Gilbert B. Richards, Jr., has been named president of OPW-JORDAN DIV., DOVER CORPORATION, Cincinnati manufacturer of auto-

NEW from A-J!

Rain and Snow-Proof EXTERIOR STATIONARY LOUVER

A-J. No. 22 Series





Here's ventilation or fresh air intake plus weather protection conveniently combined in a single unit! Completely bird-proof. This stationary exterior louver has closely spaced horizontal bars on 1/2" centers. The louver unit is 13/16" in depth, and manufactured 7/32" under listed size. All-steel construction throughout on the No. 22 style.

The No. A-22 has an extruded aluminum frame and bars of Armco Aluminized steel which gives an unbeatable combination of strength and durability for long-time exterior application.

Aluminum bug screen available at additional cost.

FREE catalog contains complete identification and selection.

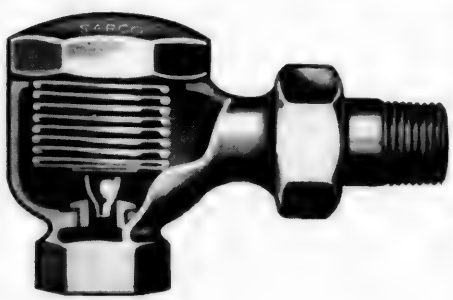
Write for your copy.

A-J MANUFACTURING CO.
Dept. V-5 3601 E. 18th St.
Kansas City 27, Mo.

Install and forget

SARCO RADIATOR TRAPS

for every 2-pipe steam heating system



Sarco Type H Radiator Trap, angle pattern

Sarco Type H vertical Radiator Trap

For a quarter century the Sarco Type H has been the standard radiator trap on 2-pipe steam heating systems. And for good reason. In Sarco lab tests, for example, samples of thermostatic bellows from these traps get fatigue resistance tests of over 50,000,000 cycles . . . solid proof of reliability.

Other Sarco advantages include extra-strong union nut and nipple; extra-rugged body; pressure tests of every trap body at maximum rated steam pressure and removable seat for easy replacement. **Get a copy of Bulletin 155** for handy trap dimension table and complete details on structural advantages of Sarco Radiator Traps. 5965

SARCO

SARCO COMPANY, INC.
AN AFFILIATE OF SARCOTHERM CONTROLS, INC.
[illegible] MADISON AVENUE, NEW YORK 22, N. Y.
PLANTS [illegible]
STEAM TRAPS • TEMPERATURE CONTROLLERS
STRAINERS • [illegible]

CUT MAINTENANCE COSTS

with this new design duct fan

Entire half of cone comes off . . . not just an access door . . . exclusive feature

While the DE BOTHEZAT® Bifurcator® **remains in the duct,** this new design duct fan provides an **easier, quicker** way to remove the fan wheel or motor . . . **speeds up** periodic inspections of fan wheel and extension shaft. The entire half of the cone unbolts and comes off, allowing plenty of room to work.

U. S. Patents 2,898,030, 2,978,167

dependable . . . easy to install

Installation is as fast and simple as putting in a section of ductwork. DE BOTHEZAT direct drive motor, completely isolated from fumes and heat, insures steady, trouble-free operation over long periods. Ideal for handling corrosive fumes.

Write for literature. Use coupon below.

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American Machine and Metals, Inc.
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Yes, I'm interested in cutting maintenance costs with DE BOTHEZAT Bifurcator Fans and the exclusive removable cone design. Please rush descriptive literature.

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Published ratings on DeBothezat Fans tell you exactly what the complete fan unit puts out. No guesswork — no allowance to be on safe side!

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TROY LAUNDRY MACHINERY • RIEHLE TESTING MACHINES • DE BOTHEZAT FANS • TOLHURST CENTRIFUGALS • FILTRATION ENGINEERS • FILTRATION FABRICS • NIAGARA FILTERS • UNITED STATES GAUGE • AUTOBAR • AUTOMATIC DEVICES • LAMB ELECTRIC COMPANY • HUNTER SPRING COMPANY • GLASER-STEERS CORPORATION

matic regulator and control valves. Aged thirty-three, he becomes one of the youngest chief executives in the valve and control field . . .

Bruce W. Ellis, who has been with BUFFALO FORGE COMPANY since 1935, and serves as chief engineer of its Buffalo Pumps Division, has been appointed a vice-president of Buffalo Forge Company . . .

Reuben W. Pelto has become vice-president and manager, truck unit sales, and Norbert K. Hall has been appointed vice-president and manager, air conditioning, THE READY-POWER COMPANY, Detroit, Mich. . . .

Edward C. Johnson has been appointed central sales manager of NORMAN PRODUCTS COMPANY, division of JOHN J. NESBITT COMPANY. His territory includes sixteen central states . . .

T. M. Evans, chairman of CRANE COMPANY, announced the election of Robert E. Casner as a vice-president of the company and his appointment as general manager of Plumbing, Heating and Air Conditioning Group, Johnstown, Pa. . . .

William A. Donahue has been named industrial sales manager for ARNO ADHESIVE TAPES, INC., Michigan City, Ind. . . .

Promotion of E. R. Pierce from manager of York contractors to general manager, Packaged Products Branches, is announced by YORK DIV., BORG-WARNER CORPORATION, York, Pa. . . .

Herman C. Hoffmann is named to the new post of general sales manager, CARRIER AIR CONDITIONING COMPANY. John F. Kooistra has been appointed manager of direct sales and George T. Long, manager of distributor sales . . .

Bruce A. Stahl has been named district manager of the Houston, Texas, office of THE VILTER MFG. CO., Milwaukee, Wis. . . .

AIRSAN Req. U. S. Pat. Off. GREASE FILTERS

PERMANENT, CLEANABLE TYPE AG
Made especially for range canopies, galleys, kitchens, ventilation systems.

EXTRA HEAVY CONSTRUCTION
Provides better thermal mass to resist "burn-outs." Offers longer service. Also available in stainless steel enclosing frames.

PRE-ASSEMBLED UNITS for CEILING or Walls
Completely pre-assembled units available . . . just set in place and bolt together. Save time and labor costs. Eliminates complex assembly problems. Available in stainless steel, steel, aluminum.

REDUCE FIRE HAZARD PROBLEMS resulting from grease laden fumes as AIRSAN GREASE FILTERS prevent grease from entering exhaust ducts, protect motors . . . increase working comfort.

For Safer Kitchens in Hospitals, Industrial Plants, Hotels, etc. Write for Bulletin G505

Air Filter Corporation

A few distributorships available. Write for details!

Send for FREE Bulletins!

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Canadian Representative: **DOUGLAS ENGINEERING CO., LTD., TORONTO**

GET LONGER LIFE FROM YOUR AIR-CONDITIONING CONDENSER TUBES...

ALKASERTS are erosion-resistant, polyethylene inserts which push-fit easily, securely in inlet ends of new or old condenser tubes. No adhesive needed to install. Flexible, dimensionally stable at 70°C. (158°F.).

PROTECT NEW TUBES
Use "Standard" ALKASERTS. Streamlined to eliminate water flow restriction. Feathered to very thin edge. Snug fit into tube end. No danger of water seepage between tube and ALKASERT.

ALKASERTS®

PATENTED

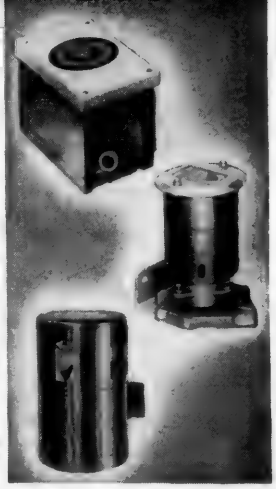
INCREASED SERVICE FROM OLD TUBES
Use "Expanded" ALKASERTS. Made in graduated sizes to match wear pattern found in normal installations.

Write for our new illustrated Bulletin 600.

TENNANT DEVELOPMENT CORPORATION
100 PARK AVENUE • NEW YORK 17, N. Y.

A Complete Line...

LOW COST
CONDENSATE
DISPOSAL PUMPS
designed for
AIR CONDITIONING AND REFRIGERATION



MODEL AB-F
"All-Plastic" low cost unit. 9 ft. V., lift. 300 ft. H. run. In-pan installation. Sump available when required.

MODEL "C"
For CLOSE-TO-FLOOR, low inlet connection. 21 ft. V. lift. 300 ft. H., run. Packaged unit. Long life.

MODEL C21-F
Extra Heavy Duty pump, with sump and float switch built in. Trouble-free service. 21 ft. V. lift. 300 ft. H. run.

ALL MARCH PUMPS ARE FURNISHED WITH 110/220 VOLT MOTORS. FACTORY TESTED AND READY TO RUN. MINIMUM INSTALLATION COSTS.

Write today for ***Free Bulletins*** *on these pumps!*

MARCH MANUFACTURING CO.
INCORPORATED
CONDENSATE PUMPS FOR AIR CONDITIONING EQUIPMENT
7300 MONTICELLO AVENUE • SKOKIE, ILLINOIS

PALMER

Mercury Actuated Dial Thermometers now in three types to suit any requirements

PATENTED
FULL 4½" DIAL FACE. Stem can be placed at any angle and case can be rotated to any readable position.
1 RIGID STEM DIAL THERMOMETER tapered bulb, interchangeable with standard industrial thermometer separable socket. (As illustrated above.)
2 WALL MOUNTED DIAL THERMOMETER with flexible connecting armor. Case adjustable to easy reading position.
3 FLUSH MOUNTED DIAL THERMOMETER for panel mounting with flexible connecting armor.
ALL THREE TYPES HAVE A FULL 4½" DIAL FACE

■ **for accuracy:** Mercury actuated . . . Compensated by Invar. Guaranteed Accurate 1 scale division. ■ **for angularity:** Can be adjusted to most readable position at any angle desired. ■ **for readability:** Bold Black Numbers . . . 11" of scale Reading Dial face can always be placed in easiest readable position. ■ **for interchangeability:** Also specify "PALMER" Separable sockets as they are interchangeable for Dial or Industrial type Thermometers.

PALMER

PALMER THERMOMETERS, INC.
Norwood Ave., Cincinnati 12, Ohio
MFRS. OF INDUSTRIAL LABORATORY, RECORDING AND DIAL THERMOMETERS

Briefly Stated

Laurence L. Prince is the new sales manager for BRADLEY WASHFOUNTAIN CO., Milwaukee, Wis. He will be in charge of the company's fifty-nine sales representatives throughout the country . . .

Alfred L. Otis will succeed Charles R. McConner as general sales manager of CLARAGE FAN CO., Kalamazoo, Mich. Mr. McConner will be in semi-retirement, serving on special asignments . . .

Willard S. Levings is named manager of the Boston office of THE TRANE COMPANY . . .

Richard F. Kelly, previously manager of distribution, has been named general sales manager for Packaged Products, YORK DIV., BORG-WARNER CORPORATION . . .

Paul E. Evans has joined DRYER DYNAMICS CORP., Lyndhurst, N. J., as sales manager. The company manufactures tubular centrifugal fans and other air handling equipment. In the past four years he headed his own company, representing fan and coil manufacturers in the New York metropolitan area. Previously, he had been with Buffalo Forge . . .

Frederick J. Laughna has been named director of sales and distribution for CHRYSLER AIRTEMP, a post vacated when T. W. Kirby was promoted to vice-president, marketing . . .

The American Board of Industrial Hygiene invites inquiries from those who are interested in applying for voluntary certification in the profession of industrial hygiene. Certificates will be issued on the basis of an examination to those who have eight years of practice following a suitable baccalaureate degree. No examination will be required of those who have fifteen years experience following acceptable education. A brochure describing the certification program and giving more details is available. Write Henry F. Smyth, Jr., Secretary-Treasurer, 4400 Fifth Ave., Pittsburgh 13, Pa.

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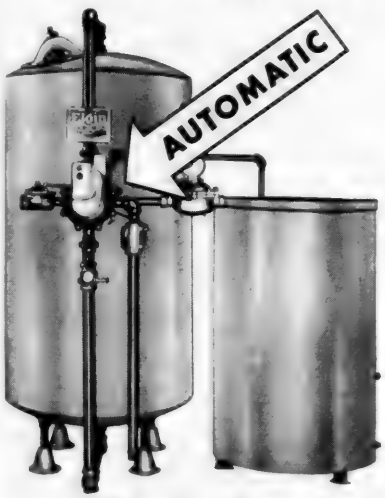

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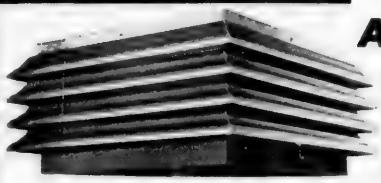

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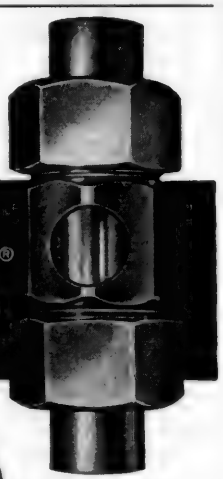

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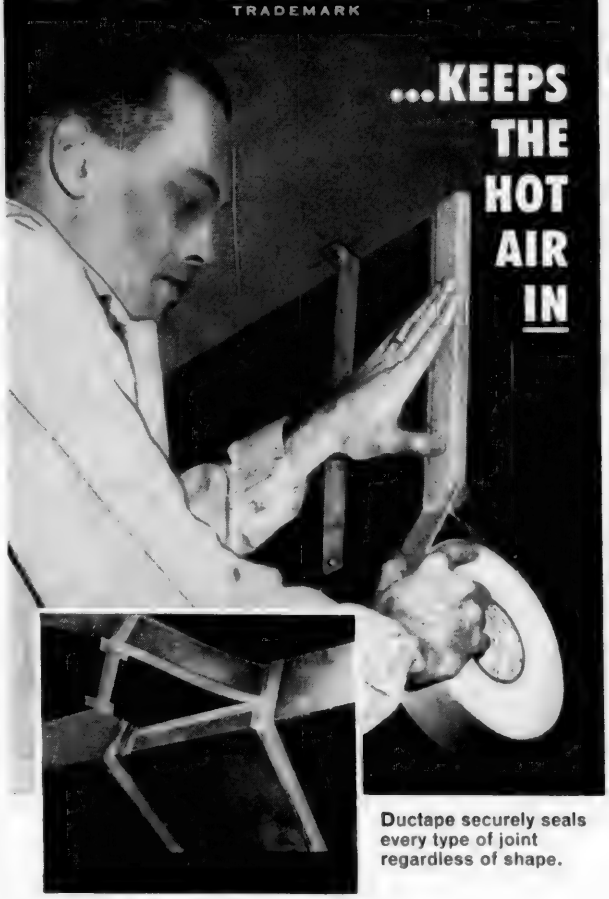

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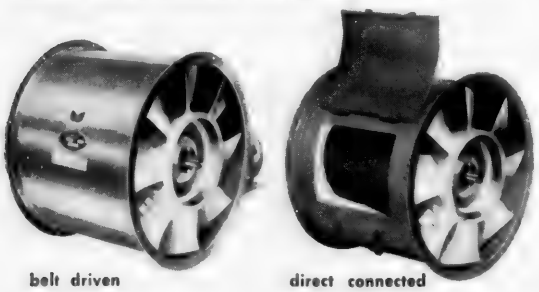

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COMING EVENTS

Where listed, names or titles of individuals are those from whom further information is available.

MECHANICAL CONTRACTORS ASSOCIATION-CONVENTION—72nd annual convention of MCA of America, 45 Rockefeller Plaza, N. Y. 20 N. Y. will be held at Miami Beach's Fountainebleau Hotel, Miami, Florida. .....**MAY 9-12, 1961.**

BRI SPRING CONFERENCES—Building Research Institute Spring Conference, Shoreham Hotel, Washington, D. C. BRI, 2101 Constitution Ave., Washington 25, D. C. .....**MAY 16-18, 1961.**

DESIGN ENGINEERING CONFERENCE AND SHOW—Design Engineering Show, Cobo Hall, Detroit, Michigan. Exposition management by Clapp and Poliak, Inc., 341 Madison Ave., New York 17, N. Y. .....**MAY 22-25, 1961.**

AIR POLLUTION CONTROL—54th Annual Air Pollution Control Association Meeting, Hotel Commodore, New York, N. Y., includes 18 technical sessions, over 80 papers, equipment exhibit. APCA, 4400 Fifth Ave., Pittsburgh 13, Pa. ....**JUNE 11-15, 1961.**

NDHA MEETING—Annual meeting of the National District Heating Association, Wentworth-by-the-Sea, Portsmouth, N. H. Secretary, John F. Collins, Jr., 827 N. Euclid Ave., Pittsburgh 6, Pa. .....**JUNE 12-15, 1961.**

NAPC CONVENTION—79th Annual Convention, National Association of Plumbing Contractors, 1016 20th St., N.W., Washington 6, D. C., in conjunction with the 1961 National Plumbing-Heating-Cooling Exposition, Cobo Hall, Detroit, Mich. **JUNE 18-22, 1961.**

ASTM ANNUAL MEETING—Annual Meeting of the American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa., at Chalfonte-Haddon Hall, Atlantic City, N. J. ..**JUNE 25-30, 1961.**

WESTERN ENGINEERING SHOW—Western Plant Maintenance & Engineering Show and Conference, Los Angeles Pan Pacific Auditorium. Management: Clapp and Poliak, Inc., Western Office, 759 Monadnock Bldg., San Francisco 5, Calif. ..**JULY 18-20,1961.**

AISA CONVENTION—10th Annual Convention and Business Conference, American Institute of Supply Associations, Inc., 1505 22nd St., N.W., Washington 7, D. C., to be held in San Francisco, Calif. Executive Secretary, George T. Underwood. .....**SEPTEMBER 24-27, 1961.**

AGA CONVENTION—43rd Annual Meeting of the American Gas Association, 420 Lexington Avenue, New York 17, N. Y., at Dallas Municipal Auditorium and Statler-Hilton, Sheraton-Dallas, Adolphus and Baker Hotels, Dallas, Tex. ....**OCTOBER 1-4, 1961.**

WESTERN BUILDING INDUSTRIES EXPOSITION—Sponsored by associations of the Western Building Industries Council, to be held at Great Western Exhibit Center, Los Angeles, Calif. Management and Exhibit Sales, A. Byron Perkins & Associates, Inc., 2216 S. Hill St., Los Angeles 7. .....**OCTOBER 7-10, 1961.**

INDUSTRIAL HYGIENE FOUNDATION—The 26th annual meeting of the Industrial Hygiene Foundation of America Inc. will be held at the Mellon Institute, 4400 Fifth Avenue, Pittsburgh 13, Pa. Dr. H. H. Schrenk, Managing Director, 4400 Fifth Avenue, Pittsburgh 13, Pa. .....**OCTOBER 25-26, 1961.**

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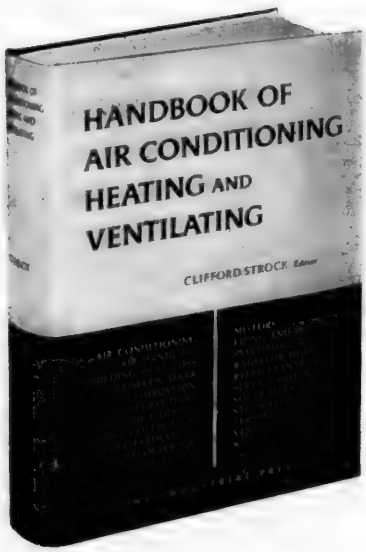

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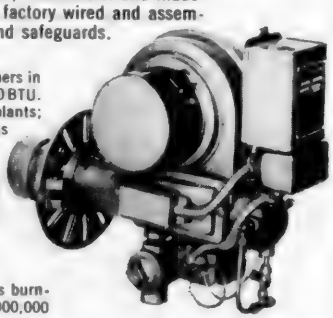

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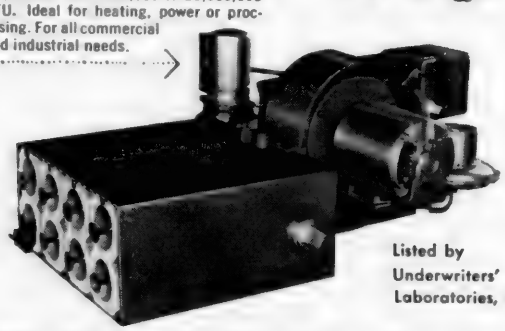

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Charlottetown, P.E.I.	1335	1220	7262	6900
Crescent Valley, B. C.	886	940	6213	6600
Edmonton, Alta.	1148	1290	7713	8660
Fort William, Ont.	1203	1380	8297	8750
Grande Prairie, Alta.	1322	1380	8317	9100
Halifax, N. S.	1122	1042	6011	5997
London, Ont.	988	1040	6213	6250
Medicine Hat, Alta.	891	1130	6525	7510
Moncton, N. B.	1282	1190	7407	7190
Montreal, P. Q.	1172	1180	7038	7240
North Bay, Ont.	1253	1350	7902	8210
Ottawa, Ont.	1183	1220	7215	7520
Penticton, B. C.	749	780	5183	5520
Prince George, B. C.	1000	1110	7142	7760
Quebec, P. Q.	1304	1300	7962	7960
Regina, Sask.	1233	1420	8092	9190
Saint John, N. B.	1225	1160	7154	7040
Saskatoon, Sask.	1219	1440	8473	9390
Timmins, Ont.	1375	1530	9099	9400
Toronto, Ont.	977	1018	5756	5936
Vancouver, B. C.	622	680	1080	4430
Victoria, B. C.	623	620	3943	4050
Windsor, Ont.	867	950	5415	5710
Winnipeg, Man.	1248	1441	8656	9178

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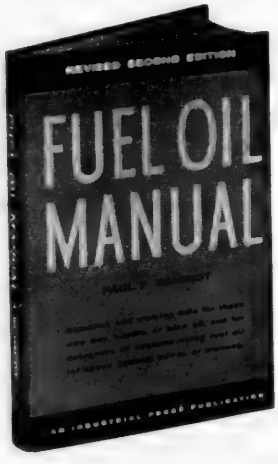

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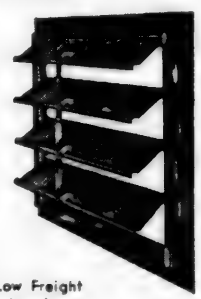

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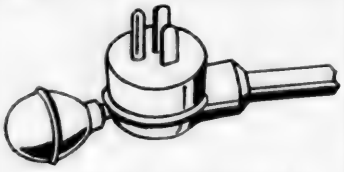

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PRINTED FORMS available for immediate shipment. Heating & oil burner materials form, burner service record cards, service order forms, inspection information form, survey sheet and others. Also can supply BURNER SERVICE form in 8 part EZE-SNAP with 3 carbons in each set. 1200 sets. Imprinted with your name, address and telephone, only $20.40. Send for samples—no obligation. Write Dept. AC, Degree Day Systems, 39-30 58th St., Woodside 77, N. Y.

MANUFACTURERS AGENTS

An established manufacturer with 25 years experience producing ventilating equipment is looking for manufacturer's agents in many sections of the country to sell their new line of industrial fans. The products include axial flow and tubeaxial fans, both direct and belt driven, and power roof ventilators.

Please reply Box 914, Air Conditioning, Heating & Ventilating, 93 Worth St., New York 13, N. Y.

WANTED

HVAC DESIGN ENGINEER. Minimum of 3 years HVAC design experience in Consulting Work, in Commercial and Industrial Buildings. Must be graduate M.E. Slocum & Fuller, Consulting Engineers, 207 E. 32nd St., New York 16, New York.

HELP WANTED — MALE

Mechanical Engineer — Experienced in design of Heating, Ventiliaton and Air Conditioning systems. Permanent employment, ideal living conditions, established office in rapidly expanding area. Furnish education and experience background. Advise when available and salary desired.

George, Miles & Buhr—Architects and Engineers
Box 1068—Salisbury, Maryland

HVAC ESTIMATOR, JR.

Established Mechanical Contractor (50 years) NYC Suburban Area. Company Benefits. Write giving resume. Box #982.

Air Conditioning, Heating & Ventilating, 93 Worth St., New York 13, N. Y.

BOOKS

. . . give you the answers to your job problems. And it's easy to get them by mail. Just read the descriptions on the insert opposite the back cover and use the prepaid order card to get the ones you want.

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when the heat's on

R-900 Multi-Temp
900,000 BTU/hr. Input

be sure it's HYDROTHERM MULTI TEMP

When the job's got to be right . . . at the right price . . . remember Hydrotherm!

Gas heat costs less than oil heat in big jobs (to 3,600,000 BTU/Hr) when you install Hydrotherm's MULTI TEMP hydronic system.

Sequence-fired combustion chambers permit automatic input modulation in accordance with load requirements — no short cycling — no override — built-in standby protection. Factory assembled . . . fits through a 2 ft. 6 in. door.

Easy to install, all cast iron, and guaranteed for 10 years . . . you can't miss with Hydrotherm.

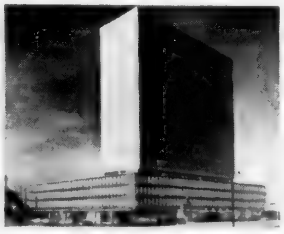
Write for bulletin #HY-F107 and all the facts.

HYDROTHERM, INC. • DEPT. 13AC, NORTHVALE, N. J.

you can design for 100% air recirculation

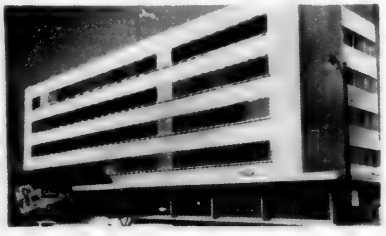
It's being done every day, with Barnebey-Cheney activated charcoal to purify recirculated inside air. And the savings in heating and cooling costs, as well as reduced initial investment, are substantial. You may, of course, bring in outside air for pressurization or design for less than 100% recirculation for specific reasons. Write today for Bulletin T-323. Barnebey-Cheney, Columbus 19, Ohio.

Business increased when this savings and loan company freshened the air in its formerly musty deposit box vaults.

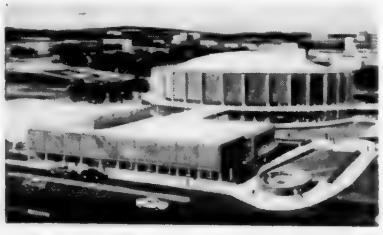


High velocity system handles 87,000 cfm; 74,000 cfm is recirculated, 40% through B-C filters, at Houston Medical Towers.

$12,000 was saved in heating installation for this church and school; heating costs cut $1,650 per year, with B-C filters.



B-C permitted reducing outside air intake to 5% in this California Teachers Association building, Los Angeles.



Over 200 B-C filters handle 218,000 cfm in conjunction with electrostatic filters at this Dallas auditorium.

The characteristic aroma of a veterinary hospital is missing from this one, thanks to B-C activated charcoal.

activated charcoal air purification

Barnebey Cheney

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Use this Digest to locate and refer to the advertisements in which you are particularly interested; then fill out and mail a prepaid postcard, either of two that appear on the yellow page following, to request further information from manufacturers.

VALVES from Jenkins Bros. were used throughout Harvard's new "pushbutton theater" for the entire complex of heating, piping, air conditioning lines.
Inside Front Cover — Item 200

UNIT HEATER CORROSION can be prevented by good trapping practice. Armstrong Machine Works offers Bulletin 252 and Catalog K.
Page 1 — Item 201

ROOF MOUNTED AIR CONDITIONER called the Atmos-Pak is described in a bulletin offered by Air Conditioning, Inc.
Page 2 — Item 202

FLUSH VALVES are thoroughly dissected and described in comprehensive Catalog 66, published by Coyne & Delany Co.
Page 5 — Item 203

LOW VELOCITY acoustic terminal control units from Carnes Corp. are described in ATC Catalog No. 1361.
Page 7 — Item 204

HIGH VELOCITY acoustic terminal control units from Carnes Corp. are described in ATC Catalog No. 1160.
Page 9 — Item 205

MODULAR DIFFUSER for versatile air distribution is described by Carnes Corp. in Catalog No. 460.
Page 11 — Item 206

WATER TUBE BOILER called Drum Modulatic by Vapor Heating Corp. is called world's most compact heat and power package. Bulletins are offered.
Page 13 — Item 207

PNEUMATIC CONTROL SYSTEM from Johnson Service Co. maintains an ideal climate for business efficiency in new Union Carbide building.
Pages 14-15 — Item 208

GAS COOLING SYSTEM grows along with headquarters building of Yellow Transit Freight Lines. Information available from Arkla Air Conditioning Corp.
Pages 16-17 — Item 209

THERMOSTATIC SHOWER MIXER provides showering comfort and safety. Unit is entirely recessed into wall.
Page 18 — Item 210

NEW COIL from McQuay Inc. provides high performance efficiency for water, steam, direct expansion or special fluid. Information is available.
Page 19 — Item 211

GALVANIZED SHEETS called Softite by Wheeling Steel Corp. have everything sheet metal men want. Full facts are available.
Pages 20-21 — Item 212

FIBER GLASS INSULATION from Pittsburgh Plate Glass Co. is easy to handle and install. Full information is available.
Page 22 — Item 213

AIR FILTERS called ULOK by Union Carbide Development Co. are available in cube-type and panel-type models. Bulletins are offered.
Page 24 — Item 214

CENTRIFUGAL PUMP with packed stuffing box is described in Bulletins 107 and 107-H by Chicago Pump.
Page 25 — Item 215

COOLING TOWERS from Halstead & Mitchell have 20-year guarantee on wetted deck surface. Bulletins EC-500 and ECKB-601 are available.
Page 26 — Item 216

CENTRIFUGAL PUMP from Fairbanks, Morse & Co. is a split-case unit offering maintenance-free operation. Bulletin No. 5820 is available.
Page 27 — Item 217

CENTRIFUGAL PUMPS from Bell & Gossett Co. provide higher heads and greater flows at 1750 rpm. Price and selection catalog is available.
Page 29 — Item 218

UNIT HEATERS from Arkla Air Conditioning Corp. maintain floor-to-ceiling temperature dfferential of 3 deg. F. Information is available.
Page 30 — Item 219

STORAGE WATER HEATERS with Patterson Kelley's Pre-Krete factory linings are guaranteed unconditionally for five years. Descriptive catalog offered.
Page 31 — Item 220

CENTRAL AIR CONDITIONING is being sold using the ARI Certification Program. Booklet is offered by Air Conditioning and Refrigeration Institute.
Page 32 — Item 221

COPPER TUBE BOILERS built by Bryan Steam Corp. provide flexibility, durability and economy in domestic and commercial heating.
Page 33 — Item 222

CONTROL CENTER combining electric and electronic controls is "brain" for McCormick Place. Barber-Colman Co. offers descriptive brochure, F-8031-1.
Pages 34-35 — Item 223

REFRIGERANTS called Genetron Super-Dry and made by Allied Chemical Corp. pay off in dependable, trouble-free performance.
Page 37 — Item 224

LIGHTWEIGHT COPPER TUBE is easy to install. Information is available from Anaconda American Brass Co.
Page 38 — Item 225

EFFICIENT FAN of Class I and II construction is described in Bulletin F-104-A by Buffalo Forge Co.
Page 39 — Item 226

FLUSH VALVE from Sloan Valve Co. incorporates many product improvements adopted after thorough experimentation and field testing.
Page 40 — Item 227

ELECTRONIC AIR CLEANING traps the expensive dirt. Precipitron units, made by Westinghouse, are described in new brochure.
Page 41 — Item 228

CONDENSATION PUMPS manufactured by Skidmore Corp. are described in Bulletins No. 19-B and No. 21-C.
Page 42 — Item 229

AIR MIXING UNITS made for dual duct systems by Buensod-Stacey Corp. maintain constant air volume regardless of static pressure variance.
Page 43 — Item 230

AIR DISTRIBUTION PRODUCTS are described by Connor Engineering Corp. in the following bulletins: K-45, K-33A, K-46, K-52, 31F, K-20A, K-27A, and K-40.
Page 45 — Item 231

ROOM TEMPERATURE CONTROL at Pure Oil's new home is maintained and supervised by a Honeywell Selectographic DataCenter. Information is available.
Pages 46-47 — Item 232

AIR MOVING EQUIPMENT from Peerless Electric Div. provides controlled performance and dependable service. Information is available.
Page 48 — Item 233

AIR COOLED CONDENSING UNIT from Tuck-Aire Furnace Co. has special head-pressure control. Complete specifications are offered.
Page 49 — Item 234

Ad-Digest

AIR HANDLING PROBLEMS are easily solved with central station air conditioners made by The Trane Co. Information is available.
Pages 50-51 Item 235

PIPE INSULATION made by Gustin-Bacon Mfg. Co. for insulating valves and fittings is covered by specifications in this month's ad. Complete specifications are available.
Page 53 Item 236

AUTOMATIC AIR VENTS for hydronic heating and cooling systems are described in a catalog which is offered by manufacturer, Maid-O'-Mist, Inc.
Page 119 Item 237

INDUSTRIAL HEATING and cooling equipment is available from Lennox Industries, Inc. in a complete line of high efficiency units. Information offered.
Pages 120-121 Item 238

AIR CONDITIONING by Drayer-Hanson Div. serves San Francisco's famed Fairmont Hotel. Brochure 150.01 is offered.
Page 122 Item 239

SURFACE TEMPERATURE readings are fast, accurate and easy with the Alnor Pyrocon, manufactured by Alnor Instrument Co.
Page 123 Item 240

AUTOMATIC CONTROL made by Tork Time Controls, Inc. is 7-day time switch with 20-hour reserve power. Catalog is offered.
Page 124 Item 241

PACKAGED LIQUID COOLER is now available from Bell & Gossett Co. with two complete refrigeration circuits. Application data are available.
Page 125 Item 242

INDUSTRIAL VENTILATION is easy with low cost, high efficiency propeller fans made by Hartzell Propeller Fan Co. Information is available.
Page 126 Item 243

CLEAN AIR REQUIREMENTS and how to attain them are the subject of Bulletin 121 published by Cambridge Filter Corp.
Page 127 Item 244

TURBINE TYPE PUMPS provide long life and high efficiency. Aurora Pump Div. offers bulletin S-111.
Page 128 Item 245

CONDENSING UNITS both hermetic and customized are available from Carrier Air Conditioning Co. Complete information is offered.
Page 129 Item 246

FLEXIBLE HOSE and retractable duct used with metal duct systems lower installation costs. The Flexaust Co. offers details.
Page 130 Item 247

SOUND CONTROL CURB from Jenn-Air Products Co. has authenticated performance data. Bulletin 601-SC contains useful information.
Page 131 Item 248

WATER TREATMENT products from Metropolitan Refining Co. increase efficiency and decrease costs. Information is available.
Page 132 Item 249

RETURN AIR VENT SILENCERS stop noise transmission without blocking air flow. Koppers Co., Inc., offers information.
Page 133 Item 250

WATER COOLERS made by Cordley and Hayes were chosen for National stores. Line is described in catalog 61.
Page 134 Item 251

MACHINE FORMED FITTINGS for high velocity air systems are made by United Sheet Metal Co.'s Spiral Pipe Div. Complete information is offered.
Page 135 Item 252

GROUP SHOWERS save space, water and time, and are described in Catalog No. 6004 by Bradley Washfountain Co.
Page 136 Item 253

CENTRIFUGAL ROOF VENTILATOR from Western Engineering & Mfg. Co. has advanced styling as low as 11.5 inches. Technical information is available.
Page 137 Item 254

GRILLES AND REGISTERS called Decoraire by Air Devices, Inc. are made of extruded aluminum and are described in catalog R-G-100.
Page 137 Item 255

COMPLETE VENTILATOR LINE is described by The Burt Mfg. Co. in free data book.
Page 138 Item 256

EXTERIOR STATIONARY LOUVER from A-J Mfg. Co. combines weather protection with ventilation or fresh air intake. Catalog describes this unit and others.
Page 139 Item 257

DUCT FAN from De Bothezat Fans Div. is easy to install and cuts maintenance costs. Descriptive literature is available.
Page 140 Item 258

CONDENSER TUBE PROTECTORS are called Alkaserts and are described in Bulletin 600 by Tennant Development Corp.
Page 141 Item 259

GREASE FILTERS for safer commercial kitchens are described by Air Filter Corp. in Bulletin G505.
Page 141 Item 260

CONDENSATE DISPOSAL PUMPS are available in three models from March Mfg. Co. Bulletins are offered.
Page 141 Item 261

DIAL THERMOMETERS are available from Palmer Thermometers, Inc. in three types to suit any requirement.
Page 142 Item 262

WATER SOFTENERS from Elgin Softener Corp. are available in automatic and manually operated models. Bulletin is offered.
Page 142 Item 263

DUCT TAPE from Arno Adhesive Tapes, Inc. provides tight duct joints. Test sample and information are available.
Page 143 Item 264

AIR MOVEMENT DEVICES from Greenheck Fan & Ventilator Corp. have complete details and specifications in catalog which is offered.
Page 143 Item 265

LIQUID INDICATORS and other members of the line of products of Allin Mfg. Co. are described in catalog E-57.
Page 143 Item 266

TUBEAXIAL FANS from Aerovent Fan Co. have eight blades, high speed and high efficiency. Details in Bulletin 350.
Page 144 Item 267

GAS BURNERS for almost every application are available from Power Flame Div., Inc. Complete literature is offered.
Page 146 Item 268

POWER-DRAFT UNITS from Quickdraft Corp. are described in Quickdraft engineering data.
Page 147 Item 269

EXTRUDED ALUMINUM SHUTTERS are illustrated and described in catalog which is offered by Elgo Shutter & Mfg. Co.
Page 147 Item 270

FIN CLEANING and straightening are easy with Fin-Comb made by Watsco Inc. Information is available.
Page 147 Item 271

PUMP CONTROL is safe, simple and easy to use. Only Kenco pumps have these dependable controls.
Page 148 Item 272

HYDRONIC SYSTEM called Multi Temp by Hydrotherm, Inc. is efficient and economical heating for the big jobs. Bulletin HY-F107 contains all the facts.
Page 149 Item 273

100% AIR RECIRCULATION is possible with activated charcoal air purification. Barnebey-Cheney offers bulletin T-323.
Page 150 Item 274

REFRIGERATION PRODUCTS are available from Henry Valve Co. in a complete variety of sizes and types.
Inside Back Cover Item 275

LOW WATER CUT-OFFS on hot water boilers? Yes, says the industry and Bulletin P-30C from McDonnell & Miller, Inc.
Back Cover Item 276

Advertisements in this issue are summarized on the Ad-Digest pages preceding this page. If you want more information on advertised products, locate the Digest item number of that advertisement, circle the item number on either of the post-cards provided below.

Use the post-cards below

to obtain catalogs mentioned in this issue or further information on products described or advertised in this issue.

1. Circle item numbers of new equipment and catalog descriptions
2. Circle item numbers of advertisements as shown in the Ad-Digest on the preceding pages
3. Mail . . . we'll do the rest

CIRCLE FOR NEW EQUIPMENT AND LITERATURE INQUIRIES

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NAME .....

TITLE .....

COMPANY OR FIRM .....

NATURE OF FIRM'S BUSINESS .....

STREET .....

CITY .....ZONE ....STATE .....

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May '61

FIRST CLASS
Permit No. 53
New York, N. Y.

BUSINESS REPLY MAIL
No Postage Stamp Necessary if Mailed in the United States

POSTAGE WILL BE PAID BY

Air Conditioning, Heating and Ventilating
93 WORTH STREET
NEW YORK 13, N. Y.

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NAME .....

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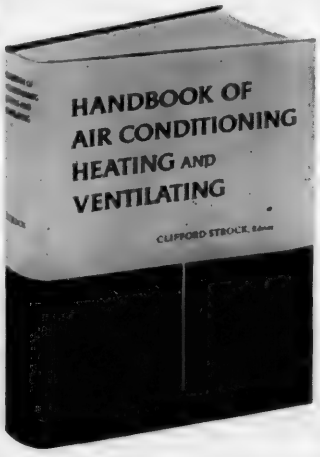
May '61

AN ENGINEERING LIBRARY IS A VALUABLE ASSET

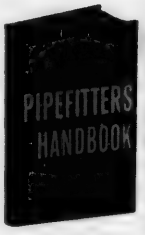
START BUILDING YOURS TODAY



HANDBOOK OF AIR CONDITIONING, HEATING AND VENTILATING

Edited by Clifford Strock

Completely new book containing thousands of facts, figures, data and principles; hundreds of charts, tables and maps. Answers problems you face every day in your work. Subjects treated thoroughly include: Air Conditioning, Air Handling, Building Heat loss, Climatic Data, Combustion, Degree-Days, Dual Duct Design, Dust Collection, Fuel Estimating, High Velocity Air, Mathematics, Motors, Piping and Plumbing, Psychrometry, Radiator Heating, Refrigerants, Service Hot Water, Solar Data, Steam Flow, Ventilation, Warm Air Heating, Terminology and a complete cross index. **1094 Pages, 7¾" x 10¾", 598 Charts, Maps, Illus., 518 Tables, $15.00.**



PIPEFITTERS HANDBOOK

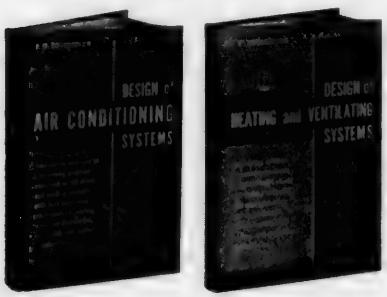
Enlarged Second Edition
by Forrest R. Lindsey

Written by a pipefitter for pipefitters. Covers: Pipe Bending — Screwed Offsets — Mitered Joints — Dimensions—Screwed Fittings — Butt Welding Fittings — Flanges and Flanged Fittings—Solder Joint Fittings—U-Bolts—Spacing of Hangers—Water in Pipes—Pipe Expansion—Identification—Contents of Tanks — Valves — Plastic Pipe — Metals — Steam — Mathematical Data — Measures — Conversion Tables—Trigonometry—Field Layout of Angles — Dictionary. **416 Pages, 248 Illustrations, $6.00.**

DESIGN OF AIR CONDITIONING SYSTEMS

by F. W. Hutchinson

115 full-page charts solve problems of air conditioning system design involving cooling load, duct design, psychrometrics, solar energy, comfort conditioning, panel cooling, etc. For each chart the engineering and mathematical background plus design example and solution are given. **336 Pages, 118 Illus., $7.00.**



DESIGN OF HEATING AND VENTILATING SYSTEMS

by F. W. Hutchinson

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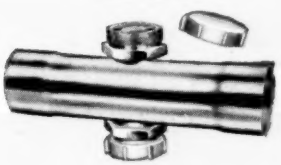

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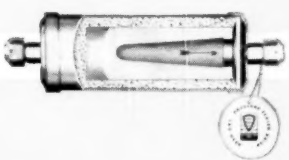

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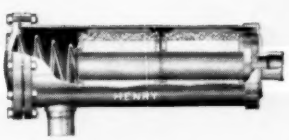

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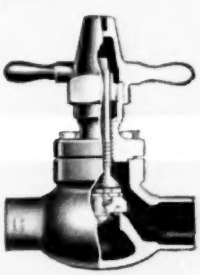

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Low Water Cut-offs on Hot Water Boilers?

...the industry has given the answer

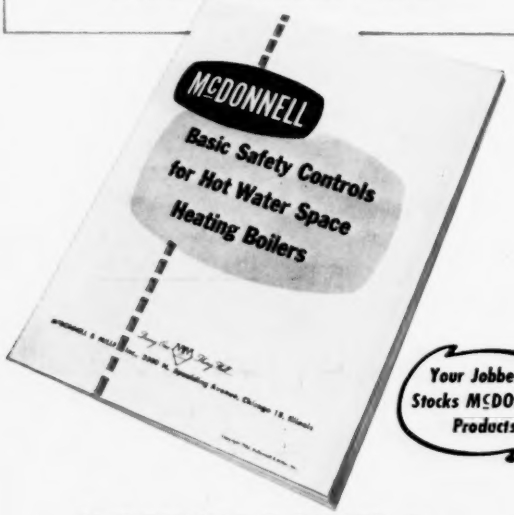
Yes, the answer has come from the field . . . from the engineers, contractors and manufacturers. They have seen the logic of installing a water level control on hot water space heating boilers . . . a low water cut-off, or—for even greater precaution—a feeder cut-off combination.

We knew it was a good idea. Expected it to grow and grow. But frankly we have been surprised at how rapidly the heating industry has taken hold of water level control as a logical team mate for an ASME pressure relief valve.

In fact, many local codes now require a low water cut-off, or feeder cut-off combination, on hot water boilers installed in places of public occupancy—including multiple dwelling units.

Notice the diagrams of recommended installations opposite. For more detailed discussion get this booklet that tells the whole story: "Basic Safety Controls for Hot Water Space Heating Boilers."

The What-Why-How in eight interesting pages
Write for Bulletin P-30C



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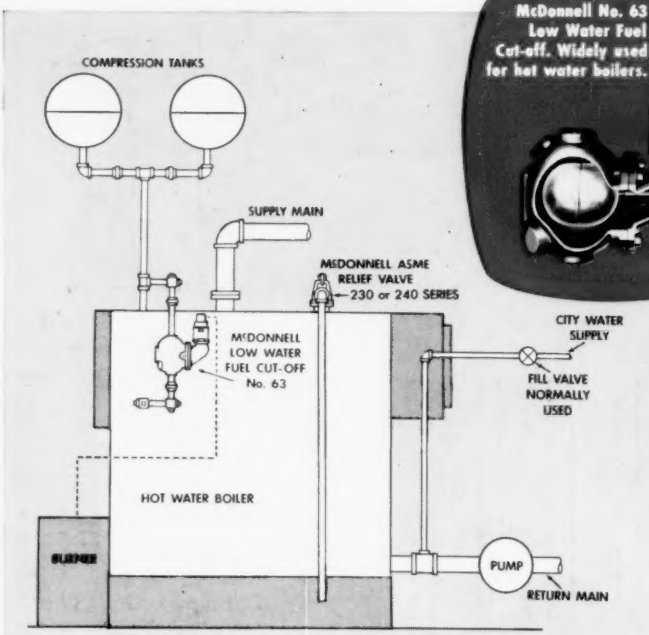

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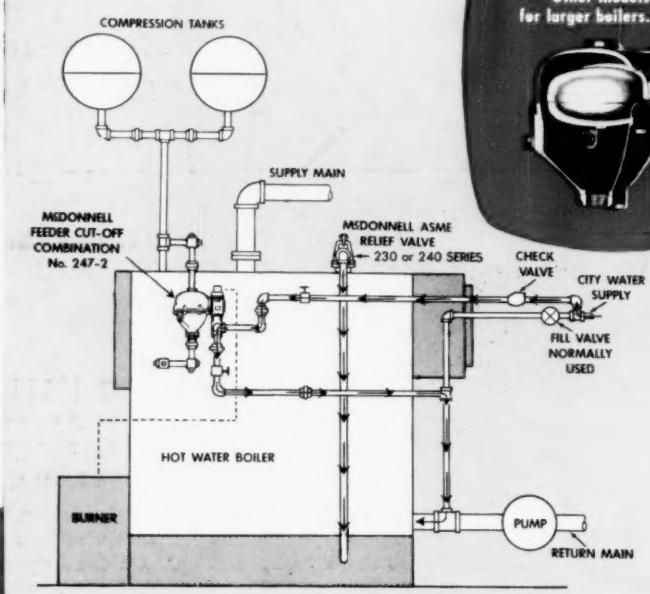

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